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EDITORIAL NOTES.

New Model Clauses—Calorific Value and Residuals.

THE Model Clauses which have been issued for the coming session of Parliament are important to the gas industry in two respects—one of which is welcome, while the other is most unwelcome and unfair, and will be provocative of further action. The one treats of the calorific power standard; the other violates the principle of free trade (which was upheld by the Joint Committee of both Houses of Parliament) in regard to the secondary products arising from the manufacture of gas. From the Model Clauses, the ones referring to the illuminating power standard and testing have been expunged; and it may now be said that, so far as all new legislation affecting gas undertakings is concerned, or at any rate in all legislation in which the standard quality of gas is in any way being dealt with, the calorific power standard will now be incorporated. The change is being effected in a very smooth manner; and there is now not the slightest doubt that the majority of gas undertakings will, at the earliest possible opportunity, take the necessary steps for bringing themselves into line with the new order of things. The model calorific clauses are put in the briefest possible form. The conditions of testing are to be those prescribed by the Metropolitan Gas Referees, who will take their instructions from the Gas Light Company's Act of last session, and arrange for the "total heat" value of the gas being ascertained. In view of this, it does not much matter that the model clauses do not mention that the standard is in terms of "gross" or "total heat" value. The standard named, 540 B.Th.U., is in roman type, and not italics—italics in the model clauses denoting that the term or figure as presented to Parliament may be varied. There is no question (the Board of Trade submitted this point to the consideration of the authorities) that the figure should not be taken by Parliamentary Committees as invariable, as the economic conditions of all gas-works in relation to the quality of their coal supply are not the same, and high calorific value is not to the consumer a real necessity. We cannot imagine what advantage the Parliamentary Authorities think is to be gained by, in the clause limiting the testing of the calorific value for penalty purposes to one day, adopting 5 per cent. instead of the 7½ per cent. prescribed in the Gas Light clauses, upon which the model clause is based. Reads the model clause: "Provided that if, on any occasion of testing, the calorific "power is found to be below the standard calorific power "by more than *five* per centum, a second testing shall be "made on the same day," &c. The "five" is in italics, so that the authorities do not intend that it shall be regarded as unalterable. Its presence, however, does not make any substantial difference, because the penalties clause does not become operative until (following the Gas Light conditions) the calorific power of the gas is found to be below the standard by more than 7½ per cent. We are pleased there is no substantial point of objection to be raised in respect of the model calorific clauses.

The other matter is of a much more serious nature. We cannot fathom the action of the Parliamentary Authorities in having persistently, ever since the Joint (Residuals) Committee of both Houses of Parliament reported, flouted the report of that Committee, and treated it, using a now famous descriptive expression, as a "scrap of paper." Contempt was shown for the report in last year's model clauses, the "General Purposes" one of which did not give the gas industry the complete liberty that the Joint Committee clearly said was its right. Most of the promoters of Gas Bills last session, however, would not adopt a model framed entirely to meet the desires of the chemical manufacturers, to set at naught the recommendations of the Joint Committee, and to deprive the industry of trading liberty equal to that enjoyed by the chemical manufacturers. Several Committees sustained the action of the promoters of Bills by not insisting upon the model clause, and by according freedom to purchase and deal in gas residual products. Then came the further violation of the recommendations of the Joint Committee in the one-third restriction imposed in the cases of the South Suburban Gas Company's Bill and the Swansea Gas Provisional Order. Now in the Model Clauses before us, from the "General Purposes" clause there has been completely deleted all reference to residual products. But, in the clause providing for the maintenance of gas-works upon the scheduled land, there appear the South Suburban provisions restricting purchasing to "one-third "of the quantity of the like residual product which shall in "that year arise directly or indirectly from the manufacture "of gas by them." The position is altogether a preposterous one; for while the Joint Committee, on the full evidence laid before them, said that the gas industry should in this matter be on an equality with the chemical manufacturers, this one-third restriction was placed upon the South Suburban Company on the scantiest evidence, and by a Committee presided over by Sir Harry Samuel, who had inflicted complete restriction on one or more companies in 1912. The insertion of the one-third restriction in the Model Clauses, in opposition to the Joint Committee's recommendation, is another evidence of an intention to by-pass the Joint Committee; and this should give an opportunity for the raising of the whole question in the House of Commons. Now that Sir Fortescue Flannery is President of the Gas Companies' Protection Association, it is a matter which he might well take in hand.

Meanwhile, we would very strongly urge upon promoters not to include in their Bills for next session the new model General Purposes clause nor the residuals restriction clause, and to instruct their several Parliamentary Agents accordingly. There were other Committees sitting last session who did not impose the restriction on gas companies; and very good models of General Purposes clauses will be found in the Chelmsford, Edenbridge, and Skegness Acts. The Parliamentary Authorities would have been acting with a greater sense of justice if they had adopted as a model one of these, instead of the one-third restriction provision, which has no justification in the result of the full inquiry by the Committee of the two Houses of Parliament.

Patriotism in Work Provision and in Trading.

BRITISH gas undertakings are without exception doing the right thing in looking after the dependants of their men who are away serving their country. The action of the managements in this respect is not only patriotic and in accordance with the best British characteristics, but it is a moral obligation. Gas undertakings, however, are in a strong position in rendering assistance to the dependants of their men who have gone forth willing to risk their lives in their country's honour and defence—strong because, whatever the severities occasioned by the war, people will, although there may be a diminution of sales, still want gas, and it will be consumed in considerable quantities, while most of the residual products will also be in demand. For the gas undertakings, there will be "business as usual," if not in the same magnitude as in normal circumstances. But there is another side of employment in the gas industry—the employment provided by the work of the contractors for plant and by the manufacturers of the other necessaries of gas undertakings. The contractors and the manufacturers have also taken upon themselves a full share in making provision for dependants of absent employees. But they are not in the same favourable position as gas undertakings in the matter of keeping on the move the wheels of their machinery. They themselves are dependent upon the gas undertakings for work. There are, however, many gas managements that have adopted a policy since the beginning of the war

of cutting on all possible contracts and orders with the view to securing temporary economy. This is not "carrying on business as usual," or helping it to be so carried on. "Business as usual" has only one meaning—and that is to keep not only one's vending side as active as possible, but coincidently one's buying side. But while all gas undertakings are anxious to keep the former as active as possible, the latter some of them are carving here and trimming there to keep it at as low a pitch as possible—forgetting that now is the time when any work in any direction that can be provided is an advantage to the country.

Contractors and manufacturers emphasized, at the meeting of the Society of British Gas Industries on Wednesday last, what we have before urged in these columns, that it is economically better to provide profitable work to prevent distress than to distribute money (except where positively necessary) to alleviate distress when actually here, and without a return in the shape of useful work. In the provision of such work, gas undertakings ought to be, and they in fact are in most districts, in the position to do something valuable. But what is found? That many of them are rigorously suspending work that they had formerly contemplated carrying out, and will not consider any new work. The Chairman of the Council of the Society (Mr. James W. Broadhead), Mr. Thomas Marsh, and others, at the meeting, appealed to gas undertakings to help to keep the employment flag flying; and Mr. Marsh did so on the ground of a real live patriotism. Patriotism does not merely consist of cheering the name of the King, and wishing good luck to our Army and Navy, but in doing—and in doing, in these times not the minimum possible, but the maximum possible. To do less than the possible maximum is unpatriotic. There ought to be a fairly considerable amount of work available in the gas industry just now, despite the fall in gas consumption in practically all but industrially busy areas. It was not long since that Mr. W. R. Herring pointed out in our columns that there are not a few gas undertakings that, during enforced slackness, could profitably employ the time in investing money in a revision of their plant to produce more economical methods and results, which would pay them hand over fist. Looking, too, at reasonably necessary prospective requirements under normal conditions, there must be a very fair amount of work that could be given out in anticipation of the better times that are bound to follow the appalling war. Appalling though it be, it should not be paralyzing or curbing to incentive, and that incentive in this instance of such beneficent order. The financial question comes in. We know that gas stocks and shares have been issued at lower prices since the war commenced; in some instances not at considerably lower prices—but prices sufficiently reduced to guard the investor against loss of dividend in the event of the raising of the price of gas. For a period in future, there may, of course, be greater difficulty than at present for gas companies in the matter of capital raising—unless some such action as that advocated in the first article in last week's issue is taken. Municipalities are provided for. They can secure, for remunerative work which they now desire to execute, money from the Government at the rate of interest the Government are paying for their war loans. There is not at the moment, therefore, the financial stringency which should act as a deterrent to aiding our domestic economic conditions by providing as much work as is reasonably possible rather than distributing money in relief in those quarters from which compensating work could be obtained.

It is rather a curious reflection that, although so much is now being said about patriotism, and the Britisher is terribly affronted who is designated as unpatriotic, there should be a widespread feeling that the newly extended code of patriotism and the ethics of home trading will, when the opportunity again arises, break down—partially at any rate—under the strain of the temptations held out to the pocket by those whom we now describe, with due emphasis, as "alien enemies." Without doubt, there will be a number of people who will yield to the temptation to buy in the cheapest market—although the exotic market may only be made the "cheapest" for the time being for the purpose of producing a recovery of trade. But, for a long time to come, we venture to think, so objectionable has the name of Germany become to the world over, that any considerable dealings with that country, other than for anything which may be a need of this country and a speciality of that, will be of a more or less clandestine nature. Even now, as Mr. Marsh pointed out at the meeting of the Society of British Gas Industries, and as many other large buyers have found, there is an attempt to use neutral Holland as the channel through which to re-establish business relations in gas mantles between (it is palpable) Germany and this country. This is against the law ruling in this land to-day. The authorities have had their attention called to this effort, and are keeping a sharp watch on consignments of goods of this character; and it will, and deservedly so, go hard with those people who are found aiding and abetting by purchase this nefarious trade and impudent imposition.

But looking beyond the present to after the war. What is going to happen? This is a question that our manufacturers and contractors are asking. They have a right to ask it, if the pocket is such a strong factor in opposition to patriotism. Our manufacturers have undoubtedly had much heavier costs to bear than their Continental rivals, partly due to the higher rates of wages here, and partly to our social legislation (both of which affect them directly on their own works, and through the cost of raw material); and beyond these considerations, their markets are limited in other countries through the operation of tariffs, while ours are all open to competitors with works across the seas. British manufacturers have consequently had drawbacks, and very real ones too; and these drawbacks will not by any means be lightened in the immediate future. These are matters that should be taken into consideration by purchasers in looking into the question of prices, although it cannot be stated that these factors have uniformly been the only ones that have operated in maintaining high prices here. However, it seems that there is an opinion among the contractors and manufacturers that they have in their own midst those who are not averse to buying materials and parts from Germany if they can get them below the prices being asked in this country. The patriotic manufacturers and contractors (who are placed at a disadvantage by this action of competitors) think that something should be done to stop such contractors incorporating foreign-made materials and parts in their work when the equally efficient materials and parts can be obtained in this country. How this might be accomplished was suggested by Mr. Fred West, who urges that consideration should be given to the question of extending the standard contract clauses by the insertion of one specifying British-made materials and parts. There is no doubt about it that the purchasing party to a contract can exercise control in this matter in the manner proposed by Mr. West; and no possible harm can come of carrying out his suggestion, because in all contracts it is easy, if there is special reason for it, to make exceptions to any conditions. While patriotism should have ascendancy in all these matters, while each one of us ought to pledge himself not to spend a penny henceforth on anything which can be produced equally well at home though the cost may be a little higher, yet in these matters we must temper our patriotism and our good resolutions with a broad commonsense. For, after all, the countries of the world are interdependent.

From the Contractors' Standpoint.

It is always refreshing to have views on the technical subjects in which one is professionally concerned from those who are interested in them from another standpoint. To the contractor for special plant, it makes interesting reading to learn what the gas engineer has to say relative to it; to the gas engineer, it must be equally a matter of interest to learn what the contractor of technical, and not merely commercial, competency has to say upon the plant and practices of the engineer's choice. We wish there was a little more exchange of views of this sort, because there are many contractors who are technically qualified to criticize and suggest, and their views are, as a rule, valuable when there is not on their part undue reticence. Their extraordinarily wide experience, too, under varied circumstances, gives them an advantage which is not possessed by the engineer whose time is spent largely within the walls of his works, with their set and regular working conditions. Since broader views have been entertained in the gas profession in regard to the position of the technical contractor, since the old highly respectable but absurd exclusiveness has gone under, and the technically equipped contractor has now obtained greater recognition, there has been an accruing advantage to the gas industry generally. It is quite true that initiative in technical advance has been largely (but not with unbroken consistency) on the side of the gas-works engineer; and this has been due to his proximity to require-

ment. But the working out of the detail of what he may initiate, and the developing and refining of the means of realizing the end, have been largely the work of the technical contractor and his staff. Many a good idea would have been ineffective, or would never have attained full practical and serviceable position, without their help. The only disability from which the contractors suffer is that, having plant of their own of special design and capabilities to sell, their views are not always disinterested, however amiable the profession of the desire to be just.

If there is one thing above all others upon which we can congratulate Mr. J. W. Broadhead, the Chairman of the Council of the Society of British Gas Industries, in connection with the address which he delivered to the members last Wednesday, it is that, though dealing with several technical matters, he was able, by a full recognition of the merit of plant that he regards as rival, to tread very lightly while expressing the beliefs born of his own experience. Gas engineers will be very interested in the address, for several reasons, among them because it deals with matters affecting carbonizing plant and the processes beyond. Mr. Broadhead, in the latter part of the address, advises the careful study of labour-saving plant from the economic standpoint, which is the usual one. When the newer labour-saving plant of gas-works is broadly considered, it is found that its advance has been not only in efficiency, but its inherent qualities have made progress in all directions, and in ways which have enlarged the field of application. This is so in the machinery for coal-handling and retort-charging, and the mechanical devices for dealing with coke. Coke-handling plant forms a good example. The telpher has come; and it has come to stay. It disestablishes the old form of conveyors, which had limited application, and always carried on their operations as though perpetually weary, at the same time frequently giving vent to the most unearthly screechings. The new form of coke conveying and stacking plant has greater elasticity; the capital expenditure required for it is less in relation to the work it does than in the case of any of the old systems of conveyor; its maintenance costs are lower; and it can readily be extended, as circumstances demand, for a comparatively low outlay. This advance in intrinsic merit has made this labour-saving method of coke-handling one of more frequent application than its precursor enjoyed; and it has brought such plant above the horizon of the engineer and manager of even the smaller works. It has therefore increased the markets of the contractors. The same in several other directions. Nevertheless, the whole address of Mr. Broadhead has threaded through it the view that the outlook is large for some further developments in the means of operation in gas-works.

Application of new invention grows; it must always be so in a progressive industry. We should, however, hardly have expected without the indications of extensive research that there were already 150 installations of vertical retorts in this country. Mr. Broadhead says there are; and we accept his statement. It was in connection with the advances made in coal carbonization for gas production that he was most interesting; and this section of the address largely bore on the question of the quality of material employed in carbonizing plant and the effect of the quality of the coal used upon the material. It was also pointed out that the character of the coal which would be usually carbonized is a factor in the choice between an intermittent and a continuous system. Of course, Mr. Broadhead—while saying that both systems have their good points, that the absence of smoke, steam, and other fumes confers on the continuous system a distinctive charm, and that it has the advantage of the coal entering the retorts at one end and coming out at the other as a dry, cool coke—is for the intermittent system. He acknowledges that it has disadvantages in comparison with the continuous system, but contends that it is a more practicable machine for gas-works practice. Why? Because, in his experience, it has a greater range in the quality of coal it can deal with—a highly bituminous coal in a continuous retort being a producer of recalcitrant charges, and so interrupting normal working. We have no care whether the continuous or the intermittent system is used, as we believe and know that both have individual virtues. But it follows from what Mr. Broadhead says in praise of the continuous method, that it has points of superiority excluding this one of the sticking of the charges; and, of course, there is the difference in the physical characteristics of the coke. This difference may be in favour of the one or the other system according to the use to which the coke is going to be put. But for some purpose other than domestic, *contra* to the somewhat denser coke of the intermittent system is the drier coke of the continuous system. But the sticking of charges, through the use of a highly bituminous coal, is not solely an occasional defect of the continuous retort. Mr. Broadhead himself acknowledges that, when intermittent retorts are old, and have begun to get somewhat out of truth, charges may hang up. So they may before the retorts have advanced in life, if there are any variations of temperature in their length, or the sides of the retorts have upon them an accumulation of deposit. We have seen intermittent retort charges held-up through these causes in this country. On the whole we do not think the point made as to sticking alone constitutes sufficient justification to the claim for a larger range of coals in the intermittent system. If Mr. Broadhead had made his point on the greater range in the direction of the inferior coking coals, there would have been more weight in the argument. If we took the matter further, we should be prepared to contend that Mr. Broadhead's argument, taken in the whole, augurs well for all future carbonizing developments in gas manufacture being along the lines of the continuous method. If anyone carefully reads the argument in the part of the address where he submits that the relationship of temperature limits, carbonizing requirements, and their effects upon fuel consumption, is not always clearly expressed, and that his belief is that the relationship holds the key to further advancement in carbonizing practice, we think it will be considered that the submissions decidedly point to a greater scope for progress, through a readily regulatable elasticity, in the continuous retort in increasing the throughput of coal, and thus reducing fuel consumption.

Independent of the question of temperatures, the vertical system requires a high grade of refractory material on account of the requisite stability, and the prevention of deflection which is obstructive to free discharge. There is another reason why high-class refractory material should be employed. Sometimes the refractory material of retort-settings has, in our opinion, been blamed for inferiority when the coal itself, through chemical action, has been the cause of deterioration of the physical stability of the material. It is really only since considerable damage has been occasioned to coke-ovens by (investigation has proved) sodium chloride that in gas-works practices the same cause has received part of the blame for the deterioration of internal retort surfaces. All coal contains some percentage of salt in its composition—a percentage which varies; the greater the percentage, the worse for the fire clay material. The percentage is found in some cases to be of almost negligible amount. How the salt acts upon the retort-surfaces is referred to by Mr. Broadhead; but a fuller description will be found in the "JOURNAL" for Sept. 2, 1913, p. 617. The removal of the destructive salt from the coal is not to be effected by simple washing, it being held closely in combination with the coal. But certainly there is scope here for investigation to ascertain whether anything can be done to stop the noxious action on the retort material by coals containing the higher percentages of salt. Meanwhile, the only thing to do is to adopt the very best refractory material obtainable, which offers the best resistance to the corrosive action as well as to the effects upon the structure of the higher temperatures of carbonization. So important does Mr. Broadhead regard this matter of the sodium chloride content of coal, that he suggests that contractors should ascertain what is the percentage in the coal ordinarily used before guaranteeing the life of the setting. Thus, though we have not, in horizontal and inclined working, met with noticeable difficulty in this regard with the coals used, it is evident that Mr. Broadhead has met with it in his experience as a contractor in different parts of the country, and using different coals. Throughout the address, there is interest of a like nature.

British Gas Interests in the War Area.

IN many ways, the claims and effects of the war are brought home to the British gas industry; but they are brought home much more acutely to administrators of, and investors of capital in, gas undertakings that are within the war area. The Imperial Continental Gas Association is such a concern. Though its works and interests are all in Germany, Belgium, France, Austria, and Holland, it is much favoured by British investors, and has been managed with distinguished skill, prudence, and diplomacy. To-day, its tale is a unique one; and it will be found in outline—for complete details

are not available even to the Board in London—in the reported speech of Sir Charles Jessel, Bart., to the proprietors at their meeting last Wednesday. He spoke plainly and frankly, refusing to go beyond what is actually known, and making it clear to the stockholders that at the present time the future is, equally for the Board as for all others, a "closed book." Between the Board and the proprietors present, sympathy was mutual; there was little evidence of any faint-heartedness as to what might betide. So far as the Berlin works are concerned, the German Government have taken over their supervision just as the British Government have taken over the supervision of the German Banks operating in this country. The Hanover and Linden works are being carried on by the Municipalities on behalf of the Association; Flushing is, of course, running just as usual; Brussels is at present unaffected, except that trade there is, of course, not normal. But at Antwerp one of the stations had no less than forty shells dropped into it, and yet only had about £2500 worth of damage inflicted. The other works in the city are intact. In the war zone in France, a small works has been destroyed; but it seems that, in the case of most of the other towns in which the Association are interested, the attentions of the artillery and the blowing up of bridges for strategic purposes, have only occasioned minor injuries to the distribution systems. Therefore things are not—up to this point—nearly so bad as might have been imagined. Whether the Association are to be heavy sufferers through bombardments in other places, or will be let off lightly, will not be known till the war further progresses, or comes to a close; for their largest interests are situated in critical places—"critical" presuming that the war is continued to the bitter end. Gas engineers and managers cannot claim any large accumulation of experience in their entire ranks of the running of gas-works with towns besieged or subjected to artillery fire; but one of the brightest parts of the story Sir Charles Jessel had to tell was of the loyalty of Resident Engineers and Managers, and of duty to the Association and to the communities served reigning supreme in their thoughts, and guiding their actions, during terrible days and amid ghastly scenes.

Railways and Delivery Delays.

Many gas undertakings are experiencing difficulty in the matter of the delivery of goods for some of which—such as gas-fires—there is pressing requirement just now. The fault for this must be attributed—and we think most gas managements will have realized this—to the exigent circumstances arising out of the war. However prompt the manufacturers are in fulfilling orders, and placing goods on the railways, they cannot guarantee that there will be no delay in transmission, in view of goods traffic very properly taking a subsidiary place to the special requirements of the War Office in connection with the transport of troops and war materials, and the conveyance of wounded soldiers to hospitals about the country. In consequence of these requirements, the railway companies are working under a complete derangement of normal conditions; and the result is delays in the delivery of goods, and sometimes, too, a temporary difficulty in tracing goods that have been despatched. A few days since a member of a wholesale firm in the city—a firm not connected with the gas industry—informed us that some goods forwarded to him from a northern manufacturing town took no less than ten days to reach his place of business. Under the circumstances, it is but fair to both manufacturers and railway companies that there should be on the part of buyers a recognition of the unavoidable conditions, and the exercise by them of a measure of (may we call it?) patriotic patience. The railway companies have just now an extraordinary primary duty to perform; passenger traffic takes second place; and goods transmission has to be sandwiched in as opportunity permits.

Methods of Calorimetry.

Mr. Malcolm Littlejohn on Saturday gave the members of the Scottish Junior Association (Western District), a useful digest of the best known methods of calorimetry; and of some of the calorimeters he read shortened descriptions on lines similar to those found in more extended form in Coste's book on the "Calorific Power of Gas." We should have liked to have seen in the paper more expression of Mr. Littlejohn's personal opinion as to the value or otherwise of the different instruments. As to his preference for the decimal system of units, we admit the facility of working with them, and that their use would save a duplication of terms, and the necessity of having tables of comparison. But the B.Th.U. is our standard; and temperatures are here popularly and generally rendered on the Fahrenheit scale. While this is so, while our own modes of expression are understood in the British Isles by more people than those of the system by which it is more convenient to work in the laboratory, then let us have results rendered in the most broadly useful manner. It is easy for the laboratory worker to make the conversions with the comparative values at hand. Moreover, Parliament has preferred in standard calorific clauses to adopt the British unit. In the final paragraph of the paper, the author refers to the calculation of calorific value from the composition of gas. He remarks that, "*if* a chemical analysis must be done, then to me it seems the easiest method would be to determine once for all the calorific values of the ordinary constituents. . . . From the percentage composition obtained from the analysis, and the known value of each of the constituents, the calorific value of the gas would be obtained sufficiently accurately for all practical purposes." Chemical analysis should, of course, be made, with the view particularly to keeping the composition of the gas within bounds in regard to the inert constituents; and as the calorific value of the constituents are already available in text-books and elsewhere (perhaps Mr. Littlejohn does not think these sufficiently accurate, the figures in the published tables being so variable), there is no trouble in making an approximate calculation of the calorific value from the analysis. But this should be a check upon, rather than in substitution of, the ascertained value by the calorimeter.

Woodall-Duckham Verticals at Bolton.

Anyone who requires a detailed description of an installation of Woodall-Duckham vertical retorts—together with an account of the approved systems of starting-up, gas-making, regulation, clinkering, scurfing, and Sunday closing-down—will find it all set out in the paper that Mr. Robert Neill read, at the meeting of the Manchester Junior Gas Association on Saturday, on the nine settings now in operation at the Bolton Corporation Gas-Works. The description portrays a plant of the latest Woodall-Duckham standard design; so there is really nothing much that can be said by way of emphasis or criticism of the points of the paper. The paper, however, shows that the modernizing of the Bolton Corporation Gas-Works continues, as opportunity offers, under the engineership of Mr. W. J. Smith. Some time since, we found a considerable quantity of interesting matter for a descriptive article in the up-to-date adaptations that had then taken place at Bolton, and now there is this continuous vertical retort plant. The engineership of these works passed from father to son; and the son—like his contemporaries—has a range of plant from which to select at one time undreamed-of by his predecessor. In the works, and in their economical operation, the result is to be seen; and all denotes not only a personal progressiveness, but progressiveness on the technical side of the industry.

German Coal, Coke, and Fuel.

The "Motor" has been discussing the fuel supply of Germany for motor purposes. On the one hand, it states that Germany is feeling the pinch with regard to liquid fuel supplies; and, on the other hand, it alleges that Roumania is still pouring fuel into the country, which is also being fed from America through neutral Dutch and Danish ports. The reported millions of gallons of petrol delivered, as well as the large supplies of heavy oil, cannot be required by the neutral countries represented by the flags that the oil-carrying steamers have been flying. At the moment, we do not think that Germany is feeling much of a pinch in regard to the oil fuel required by its military transport work. Apart from clandestine supplies, "Motor" estimates Germany's productive capacity of benzol per week at 700,000 gallons. There has been a large draft of men from the German coal-fields for military service; but the "Coal Merchant and Shipper" states that the Rhenish-Westphalian coal industry during August had an output of 8,477,214 tons of coal, as compared with 16,542,628 tons in August, 1913. The coke production is put at 1,522,230 tons as compared with 2,747,680 tons in August, 1913. From the figures, it looks as though at the present time the benzol production figure for a week, as given by "Motor," is not far wrong.

A Newmarket Controversy.

After much consideration, the Workhouse Committee of the Newmarket Board of Guardians have come to a decision on the question of the lighting of the workhouse; and it is satisfactory to find that it is in favour of gas. The Committee were offered electricity at 4d. and 2d. per unit, as compared with gas at 3s. 6d. per 1000 cubic feet. They decided not to recommend the Board to put in an installation, but to obtain estimates for incandescent gas-burners. This recommendation, as will be seen from a report which appears elsewhere, the Board, at their meeting last Tuesday, decided to adopt. Mr. J. H. Troughton, the Engineer, Manager, and Secretary of the Gas Company, is the Vice-Chairman of the Board; and he has lately been engaged in discussing with the Engineer of the Electric Light Company (Mr. F. A. Simpson) the relative merits of gas and electricity. He recently threw out a challenge to Mr. Simpson, which would have demonstrated the capabilities of gas, and, we are certain, have shown it to be far more economical than electricity for lighting, heating, and cooking purposes. If Mr. Troughton had been beaten, the local War Relief Fund would have benefited. But the challenge does not appear to have been accepted. The electricians, however, at the meeting of the Guardians, had a supporter in Mr. Playford, who made such random remarks on the subject of the efficiency of electricity as compared with gas for cooking purposes that we reproduce them. His great point was to show how excellent are the chances of electricity—with its efficiency of 97 per cent. against gas with only (this is absurd) 15 per cent.—getting the business in the future. But seeing that electricity is only 3 per cent. below its total efficiency, and that there is not a single electric cooker in Newmarket doing practical work, while gas, as rated by Mr. Playford, serves hundreds of cookers, he seems to us to have missed his point, and proved the case for gas.

The House Decorator as an Agent.

The fresh history that is being rapidly made is teaching the world more than it knew before of the great value of friendly alliances, and of the anything but comfortable position of individual isolation in the matter of friendship. This applies to business and to social, as well as to international, affairs. Through one of the reports of the British Commercial Gas Association, we were recently told that a Special Committee had been appointed to consider what action should be taken to promote mutually satisfactory working arrangements between gas undertakings and local ironmongers, plumbers, and gas-fitters. We then expressed the opinion that this was more a matter for municipal gas undertakings than for company concerns. Reasons were given for this view; and we adhere to them. But though it is more a matter for the municipal undertaking than for the gas company, it is a question that should not be neglected by the latter. A company supplying a considerable area cannot expect to have a show-room in every part; and in such cases good use might be made of a connection with, and the windows of, the local ironmongers, plumbers, and gas-fitters. But there is another tradesman who does not do business under the title of ironmonger, plumber, or gas-fitter. He is the house decorator. The very nature of his business brings him into fairly frequent contact with both householders and shopkeepers; and he is influential in an advisory capacity. Gas-fitting work and the sale of gas appliances having considerably and properly fallen into the hands of gas undertakings, the house decorator, we notice, has removed from his shop front, bill heads, and circulars, the announcement of the fact that a branch of his work is gas-fitting; and "electrical contractor" now appears in the place where some years ago there was the indication of a willingness to undertake gas-fitting. Electricity has an advantage there with the local decorator seeking work in this direction.

Night Advertisement, and a Friendly Footing.

In one district of which we have knowledge, a firm of decorators a few months since started business in a new shop. Lettered on the shop front is an announcement that the firm are open to do electrical work. Every night the shop window is illuminated by electricity in the most tasteful styles of fitting. The fittings have been frequently varied. Sometimes semi-indirect fittings (with nice cut glass bowls) are in use; sometimes drooping lights surrounded by shades of the most delicate hues. The display is continued long after the shop-door is closed for the night. There is not a great volume of light there. Such volume as there is has lately been sobered down still more, under war restrictions, by deep crimson shades. No one can fail to be attracted who passes the place when all else in the locality is dark, or when there is nothing illuminating the streets but some of the ordinary lamps. The window stands out from among all the closed shops as a single, and yet, with the few lights running, a comparatively inexpensive, but attractive, advertisement. We cannot help thinking, with the change of lighting arrangements that has been going on in this shop window, that the new small firm have allied themselves in some way with the local electricity suppliers. If they have not, then they are very enterprising, and know when and how to advertise. But what has happened in the way of visible business? The shop is a new one; the business has not been established there many months; the principal of the firm is the neighbour of several other shopkeepers. Possibly by this time he is on a friendly footing with most of them. At any rate, the interiors of certain shops in the neighbourhood have recently been fitted up for electric lighting in place of gas, although the exteriors in nearly all cases are illuminated by high-pressure gas-lamps, or have been, and will be again when there is release from precautionary regulation to assist in defeating any aerial attacks upon London that may be attempted by the enemy. But the same pretty lighting that is seen at night time in the shop of the house-decorating firm has not found place in the shops in question. The style is plain and harsh; and the metallic filaments after dusk glare at every customer who ventures into the shops.

A Point of Public Duty.

In connection with a legal case that is reported in to-day's issue, a point originally arose as to procedure which has since been argued at much length, and presumably will be argued still further, for an appeal to the House of Lords is spoken of. The facts on which the case first came before the County Court were simple. A Bradford coachbuilder ordered some coke from the Corporation, whose servants in delivering it tipped the cart in such a way that a portion of the coke went through his plate-glass window. An action for negligence was the result; and the Jury awarded damages to the plaintiff. At this stage, however, the trouble came in; for the action had not been commenced within six months of the occurrence, and so the Judge decided in favour of the Corporation, on the ground that the matter came within the terms of the Public Authorities Protection Act. This is a measure which was passed in 1893, with a view to the protection of persons acting in the execution of statutory and other public duties. It applies particularly to legal proceedings taken against local authorities in connection with the carrying-out of such duties; and it enacts that such "proceedings cannot be instituted unless they are commenced within six months next after the act, neglect, or default complained of, or, in case of a continuance of injury or damage, within six months next after the ceasing thereof." Was the delivery of this coke the execution of a public duty? In the appeal to the Divisional Court, one Judge said it was, and the other said that it was not. In the Court of Appeal, however, the decision has been a unanimous one; three Lords Justices holding that the Public Authorities Protection Act did not apply to the case in question. It will be gathered from a perusal of the case that this finding was based on the view that, though the Corporation under their own Act have power to make and sell coke, the sale to the plaintiff was a voluntary contract, and there was no statutory obligation to sell or deliver it to him. So far only two Judges have pronounced in favour of the Corporation, against four taking the other side; but the point is one that affords good scope for legal argument.

Trade Opportunities and Limits.

The topical question of the capture of German trade by English industrial concerns formed the subject of an informative article by Lord Aberconway in the last Engineering Supplement to "The Times." In his opinion, organization is the secret of the fact that Germany has been sending us great quantities of her manufactured metallurgical products, delivering them to her customers here usually at a lower price than we can actually make them at in our own works. Organization is the side of our commercial system to which he urges that attention should be given forthwith. "We are," it is argued, "suffering from too much individualism in trade; what we need is better organization of industry on more collective lines." British manufacturers are

advised to reform their methods, to organize their sales departments on a more enterprising basis, and to combine as far as possible with their rivals, so that their products may be sold without competition in price and at the same time more efficiently. This industrial combination, the writer says, must be brought about by the happy union of individual enterprise and trade combination on a firm and frank basis, and the abandonment of the idea that every man must till his own cabbage-patch and fence it off from his neighbour. He gives it as his view that "there is far too much of this jealousy in English metallurgical manufacturing concerns, especially among the salaried officials; but it may be hoped that the class of man represented on the boards of directors has a wide enough outlook to initiate and support a policy of effective combination." Some idea of the difficulties that have to be faced in one particular direction is to be gathered from the statement that Germany was recently selling common iron bars delivered in Birmingham at £1 a ton less than it costs to produce them in Midland rolling-mills. Again, it is pointed out that the tin-plate and sheet mills in South Wales are to a large extent kept going on a profitable basis by the fact that they consume great quantities of German steel billets at a price much lower than they could buy material at made in South Wales itself.

STORAGE OF INFLAMMABLE LIQUIDS.

AMONG the amendments of the Defence of the Realm Regulations of Aug. 12, prescribed by Order in Council dated Oct. 14, attention may be drawn to the following regulation relating to the storage of petroleum and other inflammable liquids:—

> 20 A.—Every place used for the storage of petroleum (whether petroleum oil or petroleum spirit) within the meaning of the Petroleum Acts, 1871 to 1879, turpentine, methylated spirit, wood naphtha, or any other highly inflammable liquid, exceeding in the aggregate 100 gallons (other than a storage place sunk below the level of the ground so as to form a pit), shall be surrounded by a retaining wall or embankment so designed and constructed as to form an enclosure which will prevent in any circumstances the escape of any part of the petroleum or other inflammable liquid.
>
> No person shall use, or permit to be used, for the storage of petroleum or other such inflammable liquid, any premises which do not comply with the requirements of this regulation.
>
> Provided that no proceedings shall, before Nov. 1, 1914, be taken against any person for a breach of this regulation, if it appears that that person has used, and is using, all due diligence to make the premises comply with the regulation.
>
> Nothing in this regulation shall prejudice the effect of any requirements as to the storage of petroleum or other inflammable liquid lawfully imposed by any local authority, or the taking of any proceedings in respect of the violation of such requirements.

Section 3 of the Petroleum Act, 1871, defines petroleum thus:

> For the purposes of this Act, the term "petroleum" includes any rock oil, Rangoon oil, Burmah oil, oil made from petroleum, coal, schist, shale, peat, or other bituminous substance, and any products of petroleum, or any of the above-mentioned oils; and the term "petroleum to which this Act applies" means such of the petroleum so defined as, when tested in manner set forth in the schedule to this Act, gives off an inflammable vapour at a temperature of less than 100° of Fahrenheit's thermometer."

By the amending Act of 1879, this limit of temperature was lowered to 73° Fahr.

Since in former regulations the expression "petroleum to which the Acts apply" does not embrace "petroleum oil"—*i.e.*, petroleum of a flash-point not lower than 73° Fahr.—the bracketing of this term with "petroleum spirit"—*i.e.*, petroleum within the meanings of the Acts—in the new Order is likely to lead to some confusion in the minds of those affected by the Order. We are, however, authoritatively informed that the new regulation does apply to all petroleums or similar oils, whatever the flash-point may be.

Gas engineers will realize the importance of this Order and its relevancy to the storage of gas oil, lubricating oil, motor and carburetting spirit, tar, and tar products. It practically entails the enclosure of every tank or set of tanks above ground of more than 100 gallons capacity, in a way which will not permit of the oil running away, beyond control, in the case of damage inflicted on the tank by bombs or other projectiles.

Trading with the Enemy in Gas Articles.—The export trade of Germany with the world at large has, as is well known, been crippled by the war. The "Journal für Gasbeleuchtung" of the 24th ult., announced that it had been informed that a Stockholm firm (the name of which we refrain from quoting) is undertaking for moderate charges the export to all parts of the world of gas articles made by first-class German firms. The Stockholm firm in question was founded in 1890, and its proprietors are Germans. This should be sufficient warning to readers of the "JOURNAL" to whom offers of German-made goods are made from this quarter.

PERSONAL.

The hope expressed at the recent meeting of the British Commercial Gas Association that when the members visit Glasgow next year they might be welcomed by Lord Provost PAXTON is, it seems, not to be realized. At last Friday's meeting, the Glasgow Corporation confirmed the result of a ballot at a private meeting the previous day, by conferring the Lord Provostship on Mr. THOMAS DUNLOP, the senior partner in a firm of shipowners and flour merchants.

Knowing that his country needs him, Mr. D. F. COLSON has taken the serious step of resigning his position as Engineer and Manager to the Weymouth Consumers' Gas Company. As many readers will be aware, Mr. Colson is the Commanding Officer of the Dorset Royal Engineers. Since July 29 he has been on duty, and so has found it quite impossible to carry on his work with the Gas Company. We have, however, no doubt that, as soon as the termination of the war releases him from his military duties, a fresh sphere of action will be open to him in the gas industry.

Mr. V. R. LANSINGH, one of the founders of the American Illuminating Engineering Society, and the holder, at various times, of the positions of Director, Secretary, Treasurer, Vice-President, and President, as well as being Chairman of some important Committees, has withdrawn from active association with the Society; and the Council have passed a resolution expressing their thorough appreciation of his pioneer work in spreading the principles of proper lighting in America, and tendering to him a hearty vote of thanks for his valuable services. The resolution has been recorded in the minutes of the Society, and an engrossed copy of it will be sent to Mr. Lansingh.

It was announced in the "JOURNAL" for the 13th ult. that Mr. JOHN GIBSON, the Manager of the Kirkcudbright Gas-Works, had been selected to fill a similar position with the Maybole Gas Company. Before leaving Kirkcudbright, he was entertained by his friends, and presented with a kit bag. In making the presentation, Provost Wallace said Mr. Gibson had greatly improved the gas-works, which were now fitted up with all the latest requirements of an up-to-date plant. Mr. Gibson, in replying, said that since he had been at the royal burgh he had received nothing but kindness from everybody. The Town Council had proved themselves model employers. In going to a higher sphere, he was proud to know that he carried with him the respect of his friends and their best wishes for his future success.

We understand that the Directors of the Australian Gas Company (Sydney) have appointed Mr. PHILIP C. HOLMES HUNT, M.Inst.C.E., Consulting Engineer for a year. It is plain, from the reports which from time to time have reached us from correspondents, that since Mr. Hunt's advent in Australia, he has made a very noticeable impression upon gas-supply affairs in Australia, through first his official position, his work since as consultant, and his example in technical and commercial practices. This important new appointment will give further scope to his abilities. His numerous friends at home will be pleased to hear of this additional evidence of the great confidence he has won for himself among the gas administrators of Australia. It may be added that Mr. Hunt is a Director of the Mount Lyall Mining and Railway Company, of the Broken Hill Water Company, and of the Williamstown Gas Company, in addition to being Chairman of the Melbourne Board of the Colonial Gas Association.

OBITUARY.

It is reported in the "Journal für Gasbeleuchtung" for the 24th ult. that Herr P. HESSEMER, for many years Manager of the Mayence Gas-Works, has died in his seventy-seventh year.

The death occurred on Sept. 11 of Herr KARL KOHN, who was for many years Manager of the Frankfort Gas Company. For nearly fifty years the deceased gentleman, who had reached the age of 77, had held office on the Council, the Finance Committee, or other Committees of the German Association of Gas and Water Engineers, of which he was President in the years 1891 and 1892.

The death took place last week (aged 76 years) of Mr. WILLIAM LOCKEY, who was for nearly thirty years Manager of the Barnard Castle Gas-Works. Mr. Lockey passed away at Alnwick, after a lengthy illness. He was a man of much kindliness, and very widely respected on the Yorkshire-Durham border. He leaves four sons and one daughter. Three of his sons are Gas Managers —at Alnwick, Hexham, and Banstead.

The death occurred on Aug. 7 of Herr a. D. M. VACHEROT, who held office at the Dresden Gas-Works from 1871 to 1895—first as Distributing Engineer and then as Manager of the Altstadt Gas-Works in the city. At one time his system of retort-settings was widely used, and in some places the settings are still at work. After 1895 he was transferred to the Dresden water undertaking, and supervised the construction of the new works which were brought into operation in 1899, and was subsequently interested in the early stages of the construction of a third works which were completed under his successor. He was born in 1837, and retired from the service of the Dresden Corporation in 1905.

THE GAS INDUSTRY AND THE WAR.

Mr. Ernest Phillips, the eldest son of Mr. Arthur F. Phillips, M.Inst.C.E., has been granted a Commission in His Majesty's Army, and is now attached to the Third Reserve Regiment of Cavalry, stationed at Canterbury.

Mr. Frank L. Bassett, B.Sc., F.I.C., who was the first-prize winner in 1911 in the "Honours" grade of the City and Guilds Examination in "Gas Engineering," enlisted towards the end of September last, as a motor cyclist despatch rider of the Third Signal Squadron of the Royal Engineers. He was attached to the Third Cavalry Division, which early in October left England with the Fourth Army Corps for the front. The motor cyclist despatch riders take the rank of Corporal; but in a letter home dated the 1st inst., Mr. Bassett mentions that he has already been recommended for a Commission. Prior to joining His Majesty's Forces, Mr. Bassett had for over three years been Assistant in Mr. W. J. A. Butterfield's laboratory in Westminster.

Friends of Mr. Eric G. Clark, a representative of Messrs. Thomas Glover and Co., Limited, and R. & A. Main, Limited, will be interested to learn that, immediately on the outbreak of war, he enlisted; and he is now serving with the Headquarters Staff of the Army Service Corps. This announcement will explain why he has not been able to call upon his friends or reply to their communications to him. Temporary arrangements have been made in the district in which he represents Messrs. Glover and Main, pending his return.

Captain R. G. S. Browning (son of Mr. R. A. Browning, Engineer and Manager of the Neath Corporation Gas-Works), Adjutant of the Sixth (Service) Battalion of the Welsh Regiment, is at the war base; his Colonel being Lord Ninian Stuart, brother of the Marquis of Bute.

Herr Albert Schmidt, the Manager of the Mulhouse Gas-Works (Mülhausen), in Alsace, has given in the "Journal für Gasbeleuchtung," a short account of the damage done to the gas-works in the town during the battle which occurred there early in August. It will be remembered that at that time the French had gained possession of Mulhouse. In the course of the expulsion of the French by the German troops, the town was vigorously bombarded on the night of Aug. 9-10. The French had established themselves on the railway embankment adjoining the new gas-works; and a violent engagement took place on the gas-works itself. The workmen had left the works about 9 o'clock, when the bombardment began, so that no more gas was made after that hour. Owing to damage to two gasholders, the store of gas only sufficed to maintain the supply until dawn. One of the gasholders had been damaged by shrapnel, and the other had been perforated by five rifle bullets. The Hasag system of distance lighting, with which all the public lamps were equipped, answered satisfactorily; the pressure wave for extinguishing them being sent out shortly before the supply of gas failed. Notwithstanding that it was impossible to give information of the restoration of the gas supply, this was effected without accident about 8.30 the following evening. The only fractures of gas-mains were three on a 4-inch main, caused by a shell which penetrated about 40 inches into the ground. It was impossible to restore the lighting completely on the day following the engagement, owing to a part of the district being cut off; but by Aug. 11 the supply of gas and public lighting were again normal.

Some fatalities in the field among German gas and water men have been reported. Herr Hans Leo, who had for nearly two years past been an assistant at the Instructional and Experimental Gas-Works at Carlsruhe of the German Association of Gas and Water Engineers, was wounded on Sept. 6 in a skirmish in France, and received the Iron Cross for distinguished conduct, but subsequently succumbed to his wounds. Herr Hermann Meyer, of Mannheim, was killed in action on Sept. 3. He had been in the service of the Mannheim Corporation since 1905, first as Works Manager of the Lindenhof Gas-Works, and, after the abolition of those works, as Engineer and Inspector of the Luzenburg Gas-Works at Mannheim. The death in action in France is recorded of Herr Schürmann, formerly a member of the Board of the Gas and Water Works Industrial Insurance Committee of Germany. Herr Schürmann was at one time in the service of the Imperial Continental Gas Association in Berlin, and was subsequently Manager of the Dantzig Gas, Water, and Sewage Works. Recently he held the position of Municipal Surveyor at Stettin. Herr Otto Stockhausen was killed in action on Sept. 8. He was in his 36th year, and had been engaged first in the construction of the Elbe Tunnel at Hamburg, and later as Water Inspector in that city. The death in action is reported of Herr Louis Vegier, the Manager of the Düren Corporation Gas, Water, and Electricity Works.

The "City of Birmingham Gas Department Magazine" for November, under the heading of "Captain R. S. Hilton," records with justifiable feelings of pride the addition of the Secretary and Manager's name to the long list of Gas Department employees who have donned the King's uniform. Mr. Hilton is in command of "C" Company of the First Birmingham Battalion of the Royal Warwickshire Regiment, at present in training at Sutton Coldfield. "C" Company is a double company, comprising about 250 men; and it is intended, if at all possible, to transfer to it the whole of the Corporation employees in the First Battalion. While at Clay Cross, prior to going to Birmingham, Mr. Hilton was a Captain in the Sixth Sherwood Foresters (Territorial) Regiment. As an expression of their loyalty and good wishes, the staff asked Mr. Hilton's acceptance of a service revolver (suitably inscribed) and holster; and these were handed informally to him on the 10th ult. by the Assistant-Secretary (Mr. A. W. Smith) and the Distributing Engineer (Mr. James Hewett), together with a document containing the signatures of the subscribers.

The "Co Partners' Magazine" of the Gas Light and Coke Company for the current month contains the record of the loss of three of the employees in the war; one of them being Lance-Corporal G. Coultman, a Reservist in the First Lincolnshire regiment that distinguished themselves at the battle of the Oise. A picture is given of a German gun captured on the occasion.

Mr. Batley, the Water-Works Engineer to the Oldham Corporation, reported to his Committee at the last fortnightly meeting that, in consequence of the war, the staff had been almost doubled. There were now 21 special constables and 42 men engaged on relief work. The extra cost was something like £75 per week. There had until lately been a difficulty in getting men. The armed police in uniform from the Lancashire and Yorkshire police forces were now on duty at the reservoirs at night, but not during the day.

From reports received from about 150 gas undertakings in the country, it is gathered that nearly 6000 men have already joined the services in one capacity or another; and an estimate is made that probably not far short of 60,000 men have gone from the whole industry in some form or other. In addition to this, it is pointed out that, where the distress calls for such a measure, coke is being distributed in large quantities, and generous contributions are being made to the various relief funds. For the, many institutions and houses being used for the accommodation of refugees, &c., gas apparatus is being freely fitted, and gas sometimes supplied without charge. It is said that, for the recruiting depôts, the York Gas Company have up to the present time fitted 42 cookers, 63 boilers, and six lamps, in addition to sundry fittings required for special lighting. The subscriptions of the employees themselves to the Relief Fund is a gratifying feature of which mention has been made on numerous occasions in this column.

The British Thomson-Houston Company, Limited, of Rugby, write: "We append herewith a telegram, as showing the sentiment of Australia, sent from our Agents in Melbourne, upon reading the notice in your esteemed "JOURNAL" of recent date regarding the result of the recruiting at the British Thomson-Houston works: 'Congratulations your sending over 900 fighters to front. We are proud of them. God-speed and victory.' It may be of interest to note that their telegram was based upon a notice of 900 recruits; but this has now been increased to considerably over 1000."

Speaking at the annual meeting of the profit-sharing employees of the Chester Gas Company, Alderman J. M. Frost, J.P. (the Chairman of the Company) impressed upon the men the urgent necessity of preserving the greatest self-control and exercising rigid economy throughout this serious conflict. He said it was satisfactory to know that the Company's employees were honourably represented in nearly all branches of the forces; and there was no need for him to speak to them as though the Company's employees had been lagging behind. This was not so, for 22 of the regular men and some half-dozen of casually employed men had already joined the Colours, and so were contributing in upholding the honour of the Empire and their Allies. What he did feel need to impress on them was that it was impossible to foretell the financial and physical strain which would be put on this country as the war proceeded; and it would require the utmost effort of each one if these were to be successfully borne.

The seven employees of the Redhill Gas Company who are serving with the Colours are being paid half-wages, and their co-partnership bonuses, and will be reinstated in their old positions on the termination of the war. A building taken by the Y.M.C.A. as a mess and entertainment room for the troops has been supplied with gas fittings and apparatus; while much-needed employment on new work has been provided for a large number of men.

At the last meeting of the Stoke-upon-Trent Borough Council, Mr. Thornton, alluding to a minute which had reference to the disposal of the stock of coke at the various works, said that at a time when everybody was making sacrifices he would like to suggest that the Gas Committee give a portion of the coke to the Mayor's Relief Fund. In Burslem, he added, they could afford to give gas away to better-off people; and he thought Stoke ought to give some coke to the poor people of the district—or, at least, it should be sold as cheaply as possible. It was pointed out, in reply, that the price of coke had already been reduced. The Lincoln City Council have agreed to a recommendation of the Gas Committee that coke be sold, at the gas-works, to neces-

sitous persons in quantities of not less than 56 lbs. nor more than 112 lbs., at the price of 2d. and 4d. respectively.

The co-operation of the Belfast Gas Department in the local administration of the Prince of Wales's Fund is a highly gratifying circumstance. Relief is given by means of food and rent coupons, and these are cashed at the gas office; the staff there doing everything possible to facilitate matters. It may be recalled that the Belfast Gas Department staff and the general workers under it were among the first to arrange for weekly subscriptions towards the fund; so that they have contributed very generously—and will continue to do so during the war—in support of the movement in the administrative work of which they are bearing so worthy a share.

The announcement is made by the Treasury that a Committee consisting of representatives of the Treasury, the Bank of England, the joint-stock banks, and the Association of Chambers of Commerce of the United Kingdom, has been formed, to whom is delegated the authorization of advances in approved cases to British traders carrying on an export business, in respect of debts outstanding in foreign countries and the Colonies, including unpaid foreign and Colonial acceptances which cannot be collected for the time being. The object in view is to assist traders by removing obstacles to the steady flow of business which have arisen through the temporary interruption of the ordinary channels of collection. The assistance to be given is intended to provide solvent traders with funds to continue their business and to pay their commercial debts to other traders or manufacturers. The Bank have agreed that no part of the advances under this scheme shall be applied to paying off or reducing loans or bank overdrafts or meeting unpaid foreign and Colonial acceptances held by the traders' own bankers. The Committee will have absolute discretion to decide whether an advance is to be made in any particular case; and, if they decide to make an advance, as to the amount. Such advance will not exceed 50 per cent. of the outstandings. In this connection, attention may be drawn to a letter appearing in the "JOURNAL" for Aug. 18 last [p. 401], in which Mr. D. Milne Watson referred to the effect on sulphate shipments abroad of the disorganization of financial relations between this and other countries. It was there stated that no payments were being received for sulphate already shipped abroad, and bankers were refusing to make payments even against letters of credit for sulphate that might still be shipped. This, it was added, meant that, for a time at least, few shipments could be made—a state of things which steps were being taken to ventilate in the proper quarter.

The South Metropolitan Gas Company's "Co-Partnership Journal" states that the total number of men who had joined the Colours up to Oct. 24 was 1178. Some portion of the terrible price in life which such a war as this demands has already unhappily had to be paid by employees of the Company—ten of whom are reported dead, while others are missing, wounded, or prisoners of war. There are printed some narratives from employees serving both on shore and afloat—narratives of the very best sort, for they are simple records of the experiences of those whom we are all proud to think are Britons. Even a driver in the Royal Field Artillery, amid the excitement and responsibility of his new occupation, does not forget his old work, for he writes: "I thought that you might like to hear my opinion of gas lighting in France, in comparison with that under the control of the South Metropolitan. Well, I have travelled a lot since landing, and to sum it up in a nutshell the South Metropolitan eclipses the places I have visited; and those I speak of are big towns."

The London Section of the Society of Chemical Industry opened their session on Monday of last week with a discussion on the "Present and Future of the British Chemical Industry as Affected by the War." Our hope, however, that the discussion would contain some reference to gas-works chemicals and residuals was not fulfilled; the remarks being of a very general character. Reference may nevertheless be made to a speech by Mr. Jacques Abady, who, alluding to the complaints that the chemical trade of this country had not bestirred itself in the past in the manner it should have done, expressed the opinion that the whole matter is largely one of temperament. The chemical industries, he said, called for qualities which were more prominent in the Germans than in the English—namely, commercial push and adequate research. In this country we suffered from a hide-bound conservatism, even the most radical of us; and so long as our social institutions were based on individualism, it must be the individual manufacturers who would decide whether it was worth while taking up the industries in question, and whether it was possible to overhaul the immense start which Germany had obtained. If the Society were to demand fiscal protection, however, as had been suggested, they would have to put something more cogent before the Government than they had had that evening.

Considerable attention was devoted to the lighting question at a meeting of the Maidstone Town Council. Mr. Wakefield, referring to a notice sent out to tradesmen with regard to the lighting of their premises, said he did not quite understand it. They were asked to shade their lamps as much as possible, and a good many of them had done so; but the Corporation themselves did not appear to have taken any action. The street-lamps and the advertisement signs were lighted at night just the same. What was the use of people putting out the lamps outside their shops, if the big arc lamps were allowed to remain alight? The Mayor (Mr. A. T. Epps) said the notice was issued by order of the Home Office, and was just a polite way of asking people to reduce their lights. He was sorry to say that very little notice was taken of it, and the order would now have to be enforced. Mr. Parks thought that it was folly to turn out the street-lamps when there was not much light outside the shops. As to the electric signs, Alderman Vaughan said the Council were under a contract, and he doubted whether they could do away with them, unless they received an order from some high authority. The Town Clerk said no order had been issued with regard to Maidstone; and until this was done they could not compel shopkeepers to extinguish or shade their lamps. The Secretary of State had, however, written to the Chief Constable saying the Admiralty had requested that steps be taken to darken electric lights or sky-signs which were visible from a distance, and which might be useful to hostile air-craft. He suggested that they should communicate with the Home Secretary asking him to make an order for the town, which would apply to elevated lights and sky-signs. Mr. Tomlin said he had noticed that the Gas Company were putting black enamel on their globes; and ultimately the councillors agreed that the arc lamps in the streets also should be "dimmed."

At a meeting of the Oldham Gas Committee, Mr. Arthur Andrew (the General Manager) reported that there were several houses in the district furnished for Belgian refugees. These the department were supplying with gas at a special low rate.

The application of the Belgians' Relief Committee at Chorley to the local Gas Committee for free gas and a load of coke to be sent to Gillibrand Hall, Chorley (where the refugees are staying for the present) was passed unanimously at the last meeting. The Gas Committee also decided to allocate 50 tons of coke, free of all charges, to the Local Relief Committee for distribution to those in distress through the war.

A letter was read at a meeting of the Athy (co. Kildare) Board of Guardians from a Streatham firm, described as the "L.O.L. Company, Lighting Engineers," in which it was stated that the writer having resigned his position as Engineer to the Selas Company, Limited, of Manchester, he and his brother had formed the "L.O.L." to supply English goods similar to those furnished by the Selas Company, whose headquarters, he alleged, were in Berlin. He also stated that all the Directors of the Selas Company were Germans, and that all profits went to Germany. The Guardians had installed a Selas plant in the Workhouse, and, in view of the letter referred to, the Clerk advised that the Company could not be paid. Since then a letter has been received from the Selas Company pointing out that they are an English firm, duly registered many years ago at Somerset House; that their only place of business is in England; that a large body of British workmen are employed in making the plant, while all the profits go to improving and developing the works and plant.

The Secretary of State for the Home Department, under the powers conferred by the Defence of the Realm Regulations, 1914, has made an order which contains several new provisions. This order is to apply to the City of London and the whole of the Metropolitan Police District, and, except where otherwise provided, to the hours between sunset and sunrise. It takes the place of the order which expired on the 1st inst., and will remain in force for two months, unless sooner revoked. The complete order is in the following terms; the additions made since the issue of the earlier one being shown in italics.

In all brightly lighted streets and squares, and on bridges, a portion of the lights must be extinguished, so as to break-up all conspicuous groups or rows of lights; and the lights which are not so extinguished must be lowered or made invisible from above by shading them or by painting over the tops and upper portions of the globes. Provided that while thick fog prevails the normal lighting of the streets may be resumed.

Sky-signs, illuminated facias, illuminated lettering, and powerful lights of all descriptions used for outside advertising or for the illumination of shop-fronts must be extinguished.

The intensity of the inside lighting of shop fronts must be reduced *from 6 p.m. or earlier if the Commissioner of Police on any occasion so directs.*

In tall buildings which are illuminated at night the greater part of the windows must be shrouded; but lights of moderate brightness may be left uncovered at irregular intervals. All large lighted roof areas must be covered over or the lighting intensity reduced to a minimum.

The lighting of railway stations, sidings, and goods yards must be reduced to the intensity sufficient for the safe conduct of business there. The upper half of the globes of all arc lights must be shaded or painted over.

Lights along the water-front must be masked, to prevent as far as practicable the reflection of the light upon the water.

The lights of trams and omnibuses must not be more than is sufficient to enable fares to be collected, and must be obscured while crossing bridges. The use of powerful lamps on motor and other vehicles is prohibited.

The aggregation of flares in street markets or elsewhere is prohibited.

In case of a sudden emergency, all instructions given by the Admiralty or by the Commissioner of Police on the advice of the Admiralty, as to the further reduction or extinction of lights, shall be immediately obeyed.

AMENDMENTS OF THE MODEL CLAUSES.

Residual Products and Calorific Power.

THE "Model Bills and Clauses" as amended and applicable to the Bills for the coming session were issued last Saturday. In the Gas Bill there have been some important alterations, which are indicated below.

In the Model Bill issued this time last year, clause 5, setting forth the general purposes of the company, read as follows:

> The company shall be established for the purpose of manufacturing and supplying gas for lighting, heating, motive power, and other purposes within the limits of this Act, and may convert, manufacture, and sell all residual products resulting from the manufacture of gas, and generally may carry on the business usually carried on by a gas company.

As the clause now stands, the words after "limits of this Act" down to the word "generally," are omitted; the clause reading as follows:

> The company shall be established for the purpose of manufacturing and supplying gas for lighting, heating, motive power, and other purposes within the limits of this Act, and generally may carry on the business usually carried on by a gas company.

In clause 5A, applicable to the Bills of local authorities, the words in the preceding Model Bill authorizing a corporation to "convert, manufacture, and sell all residual products resulting from the manufacture of gas" are omitted.

Clause 16, giving powers for the construction and maintenance of gas-works, &c., stood as follows in the Model Bill of last year:

> Subject to the provisions of this Act, the company may, upon the lands described in the schedule to this Act, erect, maintain, alter, improve, extend, and renew gas-works with all necessary machinery and apparatus, and do all such acts as may be proper for making and storing gas and for supplying gas within the limits of this Act, and may on the said lands convert and manufacture residual products resulting from the manufacture of gas.

The clause has been considerably amplified, and now stands as follows:

> (1) Subject to the provisions of this Act, the company may, upon the lands described in the schedule to this Act, erect, maintain, alter, improve, and renew gas-works with all necessary machinery and apparatus, and do all such acts as may be proper for making and storing gas and for supplying gas within the limits of this Act.
>
> (2) The company may also upon the said lands—
>
> (*a*) Work-up and convert the residual products arising directly or indirectly from the manufacture of gas by them;
>
> (*b*) Purchase the residual products arising from the manufacture of gas by other gas undertakers, and therewith manufacture other products of the same kind as the company are manufacturing from their own residual products: Provided that the quantity of any residual product so purchased by the company in any year shall not exceed one-third of the quantity of the like residual product which shall in that year arise directly or indirectly from the manufacture of gas by them;
>
> (*c*) Purchase from other gas undertakers and elsewhere and use the materials required to work-up and convert the residual products so arising from their own manufacture of gas or purchased as aforesaid;

But the Company shall not manufacture chemicals exclusively from raw materials purchased from sources other than gas undertakings, or in the manufacture of which the use of residual products produced by the company or purchased from other gas undertakings is merely subsidiary.

In the preceding Model Bill, clause 23, relating to the quality of the gas, specified that the illuminating power should not be less than 14 candles. This clause has now been omitted; clause 24, relating to the testing-place, becomes No. 23, and in its place is the following clause, dealing with the testing of the gas for calorific value:

> (1) Within six months after beginning to supply gas [or after the passing of this Act], the company shall provide at the prescribed testing-place apparatus for testing the calorific power of the gas supplied by them similar to the apparatus for the time being prescribed by the Metropolitan Gas Referees for testing the calorific value of gas.
>
> (2) The gas supplied by the company shall, when tested in the mode and under the conditions for the time being prescribed by the Metropolitan Gas Referees, be of a calorific power of 540 British thermal units, and that power is in this Act referred to as the "standard calorific power."
>
> (3) The provisions of section 12 of the Gas-Works Clauses Act, 1871, with reference to the testing for the illuminating power shall not apply [cease to apply] to the company, and sections 28 to 33 of that Act shall, in their application to the company, be construed as if calorific power were therein mentioned in lieu of illuminating power.

Clause 25 contains provisions as to testing for calorific value, and clause 26 specifies the penalties for deficiency. These clauses are as follows:

> Not more than one testing for calorific power shall be made on any one day: Provided that if on any occasion of testing the calorific power is found to be below the standard calorific power by more than 5 per cent., a second testing shall be made on the same day after an interval of not less than one hour; and the average of the two testings shall be deemed to be the calorific power of the gas on that day. The gas examiner shall forthwith deliver a report of the result of his testing [to the local authority or the Justices by whom he was appointed and] to the company; and that report shall be receivable in evidence.
>
> If on any testing the calorific power of the gas supplied by the company is found to be below the standard calorific power by more than 7½ per cent., they shall be liable to the following penalties in respect of any deficiency beyond such last-mentioned margin (that is to say):
>
> If the deficiency does not exceed 14 British thermal units, a sum not exceeding two pounds;
>
> If the deficiency exceeds 14 British thermal units but does not amount to 28 British thermal units, a sum not exceeding five pounds;
>
> For each complete 28 British thermal units of defective power, a sum not exceeding ten pounds.

The preceding clauses are in substitution of clause 25, relating to testing the quality of gas, in the Model Bill of last year.

The remaining clauses are unaltered as to the text, with the exception of the one relating to the supply of gas in bulk. Towards the end, it was originally specified that "nothing in this section shall authorize the company to lay any mains or interfere with any street beyond their limits of supply." The clause has been amended by the insertion of the words "or other pipes" after the word mains." Consequent upon the length of the new testing provisions, the total number of the clauses has been increased by one.

EFFECT OF THE WAR ON THE COAL AND COKE SUPPLIES OF GERMANY.

THE outbreak of war on the Continent has had a profound effect on the coal and coke trade in Germany. Several causes have contributed to this. Among them may be mentioned the interference with the railway transport of goods during the periods of mobilization and transfer of troops, the reduction in the staffs of miners owing to the large number called up for service, the cessation of imports of English coal, and the interruption in the export of German coal and coke. It is interesting to follow from the market reports in the "Journal für Gasbeleuchtung" the effects of the war on the production and sale of coal and coke, especially in regard to gas-works supplies.

It was reported on the 29th of August that, while during the early days of mobilization private goods traffic was prohibited on the German railways with very few exceptions, export was then being resumed to a very limited extent, especially to Austria-Hungary. Gas-works were feeling the cessation of supplies, particularly those which depended on English coal, for which they were endeavouring to obtain a substitute from other sources at moderate prices. For the time being the demand for gas coke was very brisk, as many consumers in large towns were laying in heavy stocks.

During the last ten days of August goods traffic generally was resumed between the Rhine and the Vistula; and on the left bank of the Rhine coal and coke traffic was partially resumed. Though about 60 per cent. of the normal output of coal was being raised in Westphalia, the railways could still only carry about half the normal quantity. Prices were rising, notwithstanding the cessation of exports and the reduced industrial requirements. The needs of the navy, the railways, and the armament works had increased greatly, and private consumers were advised to economize as much as possible. Coke was advocated to replace coal, as it could be produced from small coal, and the benzol and other bye-products were valuable for defensive purposes. Gas-works, however, were advised to retain coke for water-gas manufacture, in anticipation of a scarcity of coal. They were recommended also to at once apply to the authorities for more waggons, as the dearth of railway waggons was greatly interfering with supplies. A warning note also was given on the 5th of September that the supply of waggons might again be interfered with by necessary military measures. The German coal owners were doing their best to supply gas-works which had hitherto had English coal.

On the 12th of September, it was reported that the scarcity of waggons in the Westphalian district was still hindering deliveries—on the 1st of September, there were only 13,204 waggons available, as compared with about 30,000 in normal times—and everywhere prices were rising, though the large coal syndicates were not endeavouring to take unfair advantage of the shortage of supplies. The complete or partial stoppage of foundries had thrown much oven coke on the market, and in many districts this was being sold in competition with gas coke.

It was reported on the 19th of September that the Rhenish Westphalian Coal Syndicate had notified gas-works that, after the requirements of the railway, military, and naval authorities had been met, deliveries would be made of each description of coal in quantities proportional to the reduction of the output of it. It was reckoned that at that time the reduction amounted all round to about 40 per cent. of the normal output. The "Journal für Gasbeleuchtung" market reporter suggests, in view of this reduction of the supply of gas coal, that gas-works should mix washed small coal and coke-making coal with their gas coal, since owing

to the reduced production of oven coke, supplies of these grades of coal would become available at comparatively low prices.

An improvement in the supply of waggons was reported on the 26th of September—18,000 being available in the Westphalian district. The supply of coal for private users, however, still left very much to be desired. Coke-ovens were shutting-down, as two-thirds of the blast-furnaces had already ceased work. Efforts were being made to induce consumers to mix coke with coal. The sale of briquettes had fallen off by 25 per cent. Transport of coal by water to Holland was still very restricted, and railway transport was also only in moderate quantities. The Dutch mines, which raise about 1,200,000 metric tons of coal per annum, put up their prices in order that their regular customers might not suffer through increased amounts being taken by others. There was some resumption of the export trade, especially from Upper Silesia to Switzerland, Austria, and Italy. The output of the Bohemian brown coal field had increased to about 60 per cent. of the normal. Gas coke was being disposed of to rather better advantage; but fears were being entertained of goods traffic on the railways being again interrupted by the military.

On the 3rd of October, there was some improvement in the market for gas coke in North and East Germany, and in the extreme west; but interruption of traffic through troop and hospital trains had been very great on some routes. Matters were worse, however, in Central Germany, more particularly in Saxony and Thuringia, where many branches of industry were wholly or partly at a standstill. The production of oven coke was to be increased—to the detriment of gas-works—in order to provide tar for the production of fuel oil for the use of the navy. The decree which ordered the resumption of working by coke-ovens, ordered all public authorities to use oven coke as fuel wherever possible. Municipalities owning gas-works were to store their gas coke for use subsequently. The market report points out that this decree, if strictly observed by gas-works, will injure them greatly. A protest had been organized by representatives of gas-works. Meantime, the State itself had ordered, for large experimental purposes, 100,000 tons of oven coke for delivery in September, but at less than current prices.

At the same time, however, there was an improvement in the supply of waggons in almost all the districts, and deliveries of coal and coke were being made more freely to private users than hitherto. Upper Silesia, in the first half of September, sent out about half its normal delivery of coal. In Westphalia, the navy was still taking almost all the large coking coal, leaving only small descriptions for other consumers. Hamburg and other places which ordinarily are supplied largely with English coal were obtaining limited supplies at increased prices from Westphalia, Silesia, and Saxony. In order to further the export from Westphalia—of coke especially—to Scandinavia, the railway administration had introduced a lower rate for transport *viâ* Lübeck, Wismar, and Warnemünde.

The total production of coal in August last in Germany was 8,477,214 metric tons, as compared with 16,542,626 metric tons in August last year. In brown coal, the total production was 4,377,955 metric tons, against 7,672,169 metric tons in August, 1913. The coke production was 1,522,250 metric tons in August this year, and 2,747,680 metric tons in August last year.

On the 26th of September some improvement in the supply of waggons in the Westphalian district was reported—about 20,000 being available each day. Many pits were feeling keenly the reduction in the number of miners, and were limiting their operations to single shafts. The demand for South Germany was very brisk. In Upper Silesia the production of coal in September was only 45 per cent. of the normal, and in Westphalia 55 per cent. The output of Saar coal in September was 431,877 metric tons, compared with 1,087,764 metric tons in September last year.

The "Journal für Gasbeleuchtung" of the 24th of October reports that trials of coke for locomotive firing made by the Prussian railway administration had proved satisfactory, and that other German railways and other works might be expected to try coke. The water level in the Rhine had been so low recently that coal barges for the South were unable to take full cargoes. Further adverse comment is made on the decree in which public authorities are requested to use oven coke wherever possible. It is pointed out that all the gas coke hitherto consumed by these authorities represents only 2 per cent. of the country's production of oven coke, so that only a small gain in the output of the latter is being secured through the requirements of public authorities while great injury is being inflicted on the gas-works. As regards the supply of fuel oil for the navy, it is observed that gas tar is richer than oven tar in tar-oils.

Coke-Dust Briquettes.—A German patent [No. 275,511, of 1913] has been taken out by the Deutsch-Luxemburgische Bergwerks und Hütten-Actien Gesellschaft, for a process for making briquettes of coke dust by means of cement and pitch, for use in the manufacture of gas. According to an abstract of the specification in the current number of the "Journal of the Society of Chemical Industry," briquettes made from coke dust with cement alone require some time to harden, and therefore must be stored in the works. To avoid this, it is proposed to add a quantity of pitch so small that the impurities in the gas made from the briquettes can be eliminated by the ordinary purifying process. The following proportions are given: Coke, 85 per cent.; cement, 12 per cent.; coal tar pitch, 3 per cent,

ELECTRICITY SUPPLY MEMORANDA.

THE manner of the dismissal of the appeal of the Long Eaton District Council in the preferential charge action in which they were concerned at the instance of the Gas Company was really more eloquent in expressing the view of the Court than the words of the Master of the Rolls [see "Editorial" columns and "Legal Intelligence" in last week's issue], though the few words that were used by his Lordship, and the unqualified acquiescence of Lords Justices Kennedy and Swinfen Eady, were in themselves scathing enough. It is a bitter pill for the electricity industry to swallow, because it means so much to it in rectifying the abuse of the law that has been going on right and left in its midst in offering baits for new custom. It is a very good business principle for undertakings having a statutory monopoly of their particular commodity in a given district, that there shall be no "undue preference" shown, but that every person requiring electrical energy shall be entitled to a corresponding supply, on the same terms and under similar circumstances, as another person. If there were no such statutory rule, there would be all sorts of misdemeanour in management, and no means of compulsory rectification. But the unfortunate thing is that in the electricity industry misdemeanour of the kind has been very rife; and the trouble is how to set it all right. It may be that there will be no attempt whatever at amendment until the undertakings are separately arraigned for contravention of the 1882 Act. Electricity suppliers will notice the illustrations introduced by the Court in the course of the argument by Mr. Vesey Knox, K.C., as to the position of a man with a small gas-engine or a single gas-burner, who under the exercise of preferential treatment would be punished by being debarred from enjoying the special terms offered. There is no end of this sort of thing going on up and down the country—sections 19 and 20 of the Act of 1882 being violated in many places without the slightest compunction. Several undertakings allow consumers who do not use gas as an illuminant to have the current at a lower price than a man who partly uses one illuminant and partly the other. The latter may be the larger consumer of electricity, but the smaller consumer has the preference, because he does not patronize the electrically hated rival. Childish, is it not? Illegal it certainly is. And it may not be long before one undertaking will have to admit it—either voluntarily or through the Law Courts.

The Long Eaton Appeal.

Other Preference Practices Illustrated.

Not only is such preferential treatment of whole electricity consumers for lighting being practised to the disadvantage (irrespective of the quantity of electricity taken) of users of both electricity and gas. Other undertakings are doing precisely the same thing as planned by the Long Eaton Council, which illegally deprives one man of his right to a corresponding supply on terms similar to those charged to another man just because he does not comply with some arbitrary rule which introduces a preference for those honouring it, but which rule is not sanctioned by Parliament. The hairdresser may have for driving a motor for operating his brushing-machine (which may be used in very erratic manner) energy at 1d. per unit; a vacuum cleaner (with no stipulation as to the time it is used) may have electrical energy supplied to it at the same price; but a man who wants current for a motor for driving a gas-compressor must in some cases pay 5d., and perhaps the maximum per unit that the Private Act or the Provisional Order empowers. The hairdresser and the vacuum cleaner obtain a preference over the latter for a corresponding supply—that is to say, a power supply—although the units taken by the motor for the gas-compressor may be more in number. The wonderfully constructed and complicated systems of tariffs introduced by electric undertakings, the factors in arriving at which tariffs can never be understood by the man in the street, also import into the business a good deal of preference. Take the Norwich and the telephone systems as examples. The percentage on rateable value is (say) 12½ per cent. Two houses in a district are rated respectively at £60 and £100; and the 12½ per cent. charge on the one amounts to £7 10s., and on the other to £12 10s. Each house (let us for illustration assume) uses 2000 units a year for all purposes, at ½d. Including the fixed sum paid, the man in the house rated at £60 a year pays a total of £11 13s. 4d. for his 2000 units; the man in the house rated at £100 pays £16 13s. 4d. for the same number of units. Why is the man in the house rated at £60 allowed to have such undue preference that he gets current at 1·4d. per unit, while the man in the house rated at £100 a year has to pay 2d. per unit? This is not right. Mr. A. H. Seabrook, of Marylebone, has stated that his telephone system brings into his department for lighting about an equivalent of what the consumer previously paid for lighting on the flat-rate, and therefore electric current used for cooking and heating only costs the consumer ½d. per unit. There are other users of a corresponding supply—that is to say, a supply for cooking and heating—in Marylebone who pay more than ½d. per unit on a flat-rate. It would be interesting to know why the other people are allowed the undue preference of ½d. In the case of some highly rented flats, with small rooms, and only small consumption for current, another illegality is obviously committed, under the Norwich or telephone system, in receiving from the occupants more than the

maximum charge allowed per unit by Act or Provisional Order, and more per unit than is charged to other people for a "corresponding" supply—say, for lighting. At the last meeting of the Municipal Electrical Association, Mr. Christie, of Brighton, and Mr. Fedden, of Sheffield, supplied illustrations of undue preference. [See "JOURNAL" for July 7 last, p. 17.] The fact of the matter is electricians all over the country have been devising new tariffs, and have been adopting them, without any consideration as to whether they were legally entitled to do so, or whether they in any way violated the law relating to electricity charges. Much of it has probably been done in absolute ignorance of the law; but, on the part of the manager of an electricity undertaking, ignorance of the law as to charges is unpardonable.

The Electrical Press on the Decision.

Curiously the electrical papers have had little to say on the subject of the ignominious collapse of the foolish attempt to get the High Courts to declare that an evasion of the law was nothing of the kind. The "Electrical Review" reports the proceedings in the Appeal Court, but very sensibly makes no comment on them. The appeal seems so far to have escaped notice by "Electrical Industries." The "Electrician" has no sympathy with the penalizing methods of electrical undertakings as practised at Long Eaton—and elsewhere. Tucked away back in "Electrical Engineering" is found the editorial opinion that no good has been done to the electricity supply industry by bringing the matter to the Court of Appeal; and it is added: "In fact, several of the leading men in municipal electrical circles have expressed to us the opinion, which we fully share, that the Long Eaton Urban District Council should have withdrawn the offending circular at the outset, and should never have allowed the case to be brought into Court at all." And this after the Long Eaton District Council sticking out for a despotic liberty on behalf of the electrical industry! However, it is very interesting to know that the Master of the Rolls, two Lords Justices, and Mr. Justice Sargant have the support of the gentlemen at the head of the editorial staffs of representative papers of the electricity industry. Their Lordships will be very gratified indeed when (if ever) the information reaches their ears. As for "Meteor" of the "Electrical Times," he says "the case of *alleged* preferential treatment does not greatly agitate us." "Alleged!" and after the opinion of four Judges of the High Court. Further, he says "we all knew that confirmation in the Appeal Court was a *possibility*." How remarkable!

A Meteoric Error.

Then it seems that "Meteor" knows just about as much of the law relating to gas supply as he does of chemistry. He jumps erratically at a point of view, and puts it into print as a fact. He says:

> The electrical industry is hardened to injustice. It appears that an electrical undertaker may not offer advantageous terms to a consumer who uses both lighting and power, as compared with one who demands power only. *Whereas gas undertakings suffer from no such restriction; they may do as they like.* Naturally, the gas industry resented an encroachment upon this monopoly in privileges.

Gas undertakings do work under restriction in the matter of the prices they may charge; and they are compelled to treat consumers equitably. They are under what is known as a discounts clause. This clause provides:

> The company may, if they think fit, allow discounts or rebates to consumers of gas in consideration of prompt payment of gas charges not exceeding in any case 10 per cent., and, in addition thereto, or irrespective thereof, they may, if they think fit, allow discounts or rebates to large consumers not exceeding in any case 15 per cent.: Provided that all discounts or rebates shall be *of equal amount under like circumstances to all consumers*; provided also that notice of the effect of this enactment shall be endorsed on every demand note for gas charges.

But the foregoing clause is not required where section 13 of the Gas-Works Clauses Act is amended by the addition of the words:

> Provided also that *every such contract* entered into by the company shall be *alike in terms and amount under like circumstances to all consumers.*

It will be seen from these provisions that the whole object of the Legislature has been to secure that gas undertakers do not, in the matter of price, give any undue preference. Where, then, is the difference between gas and electrical undertakings? The object of the clauses quoted here is precisely identical with that of sections 19 and 20 of the Electric Lighting Act of 1882. In fact, it would be impossible for gas undertakings to go so far in differential prices as the electricity industry, and sell 100 cubic feet of gas for power purposes for 1d., while charging 3d., 4d., or 5d. per 100 cubic feet for lighting. Yet against the electrical differential prices no gas undertaking has dreamed of fighting. What the Long Eaton Gas Company have been fighting against, the Ilford Company are fighting against, and other companies will probably be fighting against, is preferential treatment, which the law says shall not obtain either in electricity or gas supply. "Meteor" asks whether the Institution of Electrical Engineers will take up the matter of the difference in the privileges of the gas and electrical industries. The first thing that the Institution of Electrical Engineers would have to do would be to find the "difference" to which the misguiding "Meteor" alludes.

The Ilford Case and its Financing.

"Electrical Engineering" refers to the Ilford case, remarking: "We understand that the main point to be fought in the action . . . is as to preferential charging to consumers whose premises are lighted entirely by electricity. The Gas Company also made a charge as to dealing in fittings without powers; but apparently the Council has consented not to do this." The question of preference to a consumer lighting his premises entirely by electricity (although a man using both electricity and gas may consume more current for lighting than the other) is one, as we have already indicated, over which the gas industry has very just cause of complaint. But we will not discuss the Ilford case. It appears, however, that the Municipal Electrical Association have been canvassing local authorities for subscriptions to fight the Ilford case—in other words, invite them to engage in a species of champerty. One of the electrical papers advocated support of this kind, almost immediately after action was taken by the Ilford Gas Company. The Electricity Committee of the Salford Corporation, on the suggestion of the Association, recommended that a contribution of £20 should be made towards the cost; but the Corporation have referred the question back. We need not comment upon the matter; the "Electrician" saves us the trouble. It says: "*We* are glad to see that the recommendation was finally referred back to the Electricity Committee. *We* cannot but think that it will be a bad thing for electricity supply if tariffs of this kind become usual. *We* have no sympathy with these penalizing methods; and *we* can only regard them as mischievous to the supply industry. For this reason, *we* must confess *we* are surprised that the Incorporated Municipal Electrical Association should support such methods. It would be much more appropriate, and a much sounder policy, for the Association to wash their hands of the whole business." The number of "we's" in the quotation certainly shows the sincerity of our contemporary.

The Romano Electric-Grill.

Speaking of the "Electrician," there is a personal matter to be settled one way or another. It was referred to a fortnight since. Just what the writer of the "Memoranda" then expected and hoped would happen has happened. The purveyor of cheap wit in the "Electrician" has repeated his discourteous and vulgar expression as to the writer being a "l—r" in regard to what was said, in the "Memoranda" on Oct. 6, as to the closing of the Romano electric-grill room. The writer "hoped" for this because it gives him a stronger hold now in asking for an explanation as to the part of the note that appeared on Oct. 6 which justified our contemporary in allowing a member of its staff to use an epithet which was not—at any rate, we hope the proprietors of that paper do not, or will not, think—appropriate to its columns. The writer gives an opportunity to the "Electrician" to point out the part of the note that justified the application of the offensive term. Was it untrue that the "Electric Grill" sign had been removed? Was it untrue that the electric-grill room was closed, and therefore the grill was not in use? Did this inquiry justify the application of the term: "Has experience been of an order that has condemned the grill to eviction, and a grill substituted which will show, through the use of another 'fuel,' a larger and more economical thermal value? Time will show." Other sentences were: "Surely, under such circumstances [those electrically advanced as to the fat sweated from chops being sufficient to pay for the electricity consumed and the meter-rent], the eviction of the grill cannot be imminent. It is hard to believe any such thing." Did these sentences justify the display of vulgarity on two occasions? The proprietors of the "Electrician," who are responsible for what appears in their columns, will perhaps consider that the expression was one that ought not, under the circumstances, to have been used by any person in their employ, and take the necessary steps to withdraw it with a prominence equal to that given to it on two occasions. It is for them to decide whether they accept this opportunity.

Owing to the war, it has been decided to hold the annual meeting of the Institution of Municipal Engineers in London this year, and to confine the meeting to business and the presentation and discussion of papers. There will, however, be an informal dinner in the evening. It was intended to have had a two days' meeting in Chester, with an attractive programme.

At the meeting of the London Section of the Society of Chemical Industry on Monday of last week, a discussion on the British chemical industry as affected by the war occupied so much time that there was no opportunity for devoting attention to the other item on the programme—the discussion of a paper by Mr. E. V. Evans, F.I.C., F.C.S., on the "Removal of Carbon Bisulphide from Coal Gas."

It is reported that two Huddersfield dyers claim to have discovered a process by which the use of aniline dyes for khaki and woollen textures generally will be unnecessary. Experiments have been carried out which, it is stated, have proved the effectiveness of the use of sulphur dyes. The cost is said to work out at considerably less than that entailed by the use of aniline or alizarine colours; and when cloth is dyed in the piece the milling properties are retained, and even increased to an extent which is impossible with German dyes.

WORKS TOPICS.

By "Modus Operandi."

Hurdle Grids.

On several occasions the attention of "Journal" readers has been drawn to the disadvantages of hurdle, as compared with ordinary, grids. These may be summarized as follows:

1. Liability of the gas to take short-cuts through the material.
2. No means of bye-passing the bottom sections of the purifier should difficulties of back-pressure arise.
3. Revivification *in situ* is by no means easily effected.
4. The cost of discharging is considerably higher, while the operation occupies a longer time.
5. Most wear and tear on the grids.

The above disadvantages, which at any rate have been noticeable in the writer's own experience, are substantial enough to cause one to give a good deal of consideration to the question before adopting this type of grid in preference to the ordinary horizontal type.

It may be as well to give, first, a brief explanation of the above points, as it is always possible that exceptional conditions may have caused the difficulties especially noticed.

1. Having regard to the fact that, with hurdle grids, there are some hundreds of vertical pieces of timber extending from the bottom to nearly the top of the purifier, there is a great tendency for the gas to ascend between the oxide and this part of the framework of the grid. Even if a few only of such defective places exist, a great deal of efficiency is lost. Uprights of any kind in a purifier are obviously a source of weakness; for the gas is so liable to rise upwards and alongside such uprights.

2. The use of hurdle grids is considered to be a cure for back-pressure troubles; but on several occasions the writer has had to discharge a purifer for this reason, fitted though it was with this type of grid. Whereas with ordinary grids the fitting of slides on each tier gives excellent control over the working of each purifier, with hurdle grids there is no possibility of bye-passing any part of a purifier. This in itself is a considerable disadvantage, and will on occasions prevent a full measure of work from being obtained before a purifier must perforce be put out of action.

3. Internal revivification takes longer, and is more inefficient, for the reason that the clean gas with its small quantity of oxygen does not really come into contact with the whole of the oxide. It appears to take short-cuts, leaving the hardest of the material untouched. This is accentuated by reason of the fact that the bulk of the material is lightly supported by the grids—thus allowing the gas to find an easy passage. Again the fact that there is one deep tier, instead of several, increases this tendency, as there is no chance for the gas to reform in the space between two tiers and take a fresh direction. Generally speaking, the writer has noticed that it occupies about twice as long to clean-up a hurdle-grid purifier, and in some cases it has been impossible to clean them completely. Internal revivification is always difficult when the back-pressure is very light, for the reason that the gas rushes through the easy places, and is not forced into every crevice and corner as when there is a good deal of resistance to its passage.

4. The discharging of such purifiers is by no means a straightforward job. As might be expected, it takes time to get a start, as the first few grids have to be dug out with considerable difficulty. To dig downwards and extract a grid that is buried from 5 to 6 feet in comparatively hard material, and in close contact with the purifier on one side and grids on the other side, is no light task. It gives opportunity for but few men to work at one time; and the same may be said of the job from beginning to end. A few only can work in the purifier, and certainly not more than half as many as when ordinary grids are used. Even then each grid has to be released from the material by pick-axe, which must be used with great care; otherwise the hurdle grids would soon be knocked to pieces. On this account alone, the writer has been constrained to empty hurdle-grid purifiers by daywork, whereas those fitted with ordinary grids have always been discharged by piecework. In adopting hurdle grids, it was thought that the discharging would be quite an easy matter, as it was expected that the grids would be released from the material by gentle pressure. But this is by no means the case. The oxide around the grids has always been too hard to be removed by shovel; and it has not been possible at any time to avoid using pick-axes.

5. A hurdle grid is a comparatively flimsy article, and it is doubtful whether it is half so durable as an ordinary grid. Considering, too, that "hurdles" are more expensive, increased wear and tear of some 100 per cent. must be anticipated. In this respect, the writer is unable to give any figures, as all the hurdle grids on which his experience is based are still in commission.

A Partial Remedy.

To overcome at least some of the difficulties here related, each hurdle grid has been divided into two parts, to enable two tiers to be made in each purifier. This plan is easily carried out, and can be done at small expense. After dividing the grid, it was found necessary to insert one additional horizontal piece into one of the two halves. A good deal of improvement is expected from this alteration. The mere fact that there will in future be two tiers, instead of one, will lessen the liability of the gas to take short-cuts, and will improve the efficiency of the internal revivification. It will further enable the bottom tier to be bye-passed, should it throw back-pressure. The smaller grids are also considerably stronger than those of 5 feet in depth, which are really too weak for the rough work they are required to do.

This suggestion is offered for the consideration of other engineers who may have experienced the same difficulties as the writer; and it is, moreover, thought that the makers of hurdle grids should give some attention to the matter.

EVENT AND COMMENT.

Coal-Tar Colours.

Numerous inquiries are afoot, both in this country and abroad, with regard to the manufacture of aniline dyes, and also of the intermediate products required in their manufacture. Coke-oven people in particular are attracted towards the latter proposition, as it does not present more than a very minute proportion of the difficulties which those considering the manufacture of the dyes will have to face. The principal products required are nitro-benzol, nitrotoluol, aniline, aniline oil or a mixture of aniline and toluidine, naphthalene, and anthracene. Crude benzol is now recovered at almost every coke-oven plant in the country, and in some instances refined benzol is made. For the manufacture of many of the dyes a specially rectified product is required, in order to produce a comparatively pure aniline. With other dyes, a mixture of aniline and toluidine is required. Hence the refining of the primary product need not be carried out to quite the same degree.

One of the chief difficulties likely to be met with, according to the views of many of our leading chemists, is the supply of pure alcohol for industrial purposes. That this has been a stumbling block will be generally admitted. But, according to the views expressed before a Commission appointed to inquire into the matter some years ago, it was by no means the predominating factor. There has been so much wild talk about transplanting the dye-stuff industry to this country, that it comes almost as a relief to read an authentic statement as to the actual difficulties. Mr. C. F. Cross, in an address he gave to the Society of Dyers and Colourists, pointed out that it was a matter calling for more than words, and that chemists knew what a colossal thing was the structure of systematic synthetic chemistry that the German had built up. Other countries—and notably the United States of America—are turning their attention to this question. Until quite recently there was practically no benzol available in the United States as a home product, owing to the cheapness of gasolene. There are now, however, several benzol-recovery plants, either at work or under construction, in connection with coke-ovens in the United States; so that, as far as raw materials are concerned, she will only be dependent on her own resources.

New Carbonizing Systems.

During the present year quite a number of new carbonizing systems have been put into operation; and it seems to the writer that a unique opportunity presents itself for the collection of much valuable information which would be of inestimable value to gas engineers. Several systems of vertical retorts are now at work, and horizontals have been completely remodelled, and the latest types of coal and coke handling and charging machinery have been installed. Chamber ovens, heated by producer gas—the latter being arranged for bye-product recovery—are at full swing in Birmingham. A proper basis has been arranged at Middlesbrough for the supply of surplus coke-oven gas to meet the requirements of the town. Darwen is just completing an installation of Munich chambers. It will be seen, therefore, that practically every system of carbonization has been erected during the year, and there is therefore an excellent opportunity of valuable comparisons being made. Very often when an engineer is contemplating the erection of new plant he inspects various systems at work; but he is met with the difficulty that one system may have been at work for several years at that particular place. It may be that, though the system enjoys a fair measure of success, yet it does not represent quite the last word with regard to the particular system. In another case, on the other hand, he is able to inspect a brand-new plant having the benefit of all the latest improvements. He is therefore at a loss exactly what allowance to make in each case.

What the writer would now suggest in connection with the above is that some scheme of comparison should be got out which would enable those interested to form a definite opinion as to the relative merits of the various systems. The basis upon which the comparisons are to be made will no doubt require much very careful consideration in order to avoid giving any one system undue advantage. It is certainly unsatisfactory to compare various plants (say) on the capital cost per ton of coal carbonized alone. Equally so is it inconclusive to compare the gas yield per ton, the cost per 1000 cubic feet into the holder, the labour costs, &c., &c. What is wanted is a more comprehensive scheme, which takes in all the factors contributing to the ultimate success of the plant. It is a case of taking stock from all points of view; and a comprehensive balance-sheet is required. This must show not only capital cost and working expenses, but also the results obtained, the labour and maintenance charges, the yield of coke, tar, gas, sulphate of ammonia, &c. The longer the time over which such an account can be spread, the more satisfactory and conclusive will be the comparison.

THE AMERICAN GAS INSTITUTE MEETING.

[From a "U.S.A." CORRESPONDENT.]

THE Ninth Annual Meeting of the American Gas Institute was called to order by the President, Mr. W. H. Gartley, in the Engineering Building, New York City, on Wednesday, Oct. 21. Following the usual order, the first item was the report of the Board of Directors. This showed the election during the year of 177 members, and an existing roll of nearly 1600. Expenses exceeded receipts by over $2000, due to the increased size of the proceedings resulting from the larger number of papers made possible by sectional meetings. As these meetings will apparently form a permanent feature of the Institute's work, increased revenue is necessary. This was provided for by a 50 per cent. increase in membership dues; these amendments, as well as others, changing the conditions of affiliation, and affording better machinery for sectional organization, being adopted on the recommendation of the Directors.

The First Vice-President, Mr. W. E. M'Kay, then took the chair during the delivery of the President's address. It referred to the European situation in these words: "Fate has ordained that those countries whose peoples have shared with us in the building up of the technique and practical development of the gas business should now be engaged in a bitter and destructive conflict; and it becomes us, in a chastened spirit of humility and thankfulness, to extend to our contemporaries in these countries, our sympathy, and, particularly to the members of the Belgian Gas Association, our extreme condolence that they should find their country devastated and its people wanderers because of a war in which they appear to have taken no initiative." It discussed the purposes of the Institute and the work it does through the public relations and the Technical Committees. It spoke of the comparative failure of the attempts to affiliate with the various State organizations. The growth of Commission control, and the relations of gas companies to these Commissions, were discussed. Because of the multiplicity of Commissions, it has become increasingly valuable and necessary to record their decisions in compact and accessible form. A movement is now on foot to issue such a digest; and the Institute was asked to co-operate in the work.

The usual annual contribution of $500 was voted to the Gas Educational Fund, which showed a student membership of 102. The report of the Nominating Committee was received with much applause. It resulted in the election of the following officers: President, E. C. Jones; First Vice-President, Walton Forstall; Second Vice-President, S. J. Glass; Secretary and Treasurer, G. G. Ramsdell; Directors, J. H. Jourdan, C. H. Nettleton, J. B. Klumpp, James Ferrier, and J. W. Dunbar. In the election of Mr. Jones, who hails from San Francisco, California, the Institute showed its desire to recognize his untiring and successful efforts both to obtain for gas its rightful place in the Panama-Pacific Exposition, and also to promote the fortunes of the Gas Congress in which the 1915 meeting of the Institute will be merged. Parenthetically here it may be stated that on all sides the hope was expressed that war clouds would give place to brighter skies in time to enable us to welcome our foreign co-workers in San Francisco next fall.

At this point, President Gartley asked for a few words from Mr. P. S. Young, the President of the National Commercial Gas Association, who spoke for co-operation between the two National Societies, and of the necessity on the part of each body to work steadily during the year—this requiring willing labourers on committee work.

The report of the Public Relations Committee detailed its activities in rendering assistance to gas companies and to State Commissions in the adoption of regulations for gas service; and members from six states bore testimony to the value of these activities.

The Technical Committee described its organization for the past year's work, and recommended some old and some new subjects for committee investigation. This was followed by other committee reports, among them Accident Prevention, which gave the first analysis ever made of accidents in the gas industry. The Committee on Exhibits called attention to the forty exhibits of novel and interesting appliances, and with this the morning session adjourned.

In the afternoon, the Manufacturing and Distribution Sections were in session from 2 to 5.30 p.m. On Thursday morning, from 10 till 12, there were sessions of the Manufacturing, Distribution, Chemical, and Accounting Sections, and again in the afternoon, from 2 to 5.30 p.m., of the Manufacturing, Illumination, Chemical, and Accounting Sections. The times given are approximate only; and in general the interest in the meetings delayed adjournment after the hour fixed for closing. These data show the broadening of the Institute's activities; and it is a pleasure to report that, as a result of the endeavour to cover various phases of the industry, the combined attendance at the different sections exceeded 500—being perhaps 200 larger than could be found at the old sessions, where the Institute met in one body, and where, therefore, at any one time only a portion of the hearers were especially interested in the proceedings. On the other hand, with the specialized section meetings, almost every one in each meeting room was eager to hear and, in hardly less number, to talk; so that in nearly every case discussion had to be cut short, even though the average time available was half an hour for each paper. The business of gas supply has grown so large that more and more men specialize in one branch; and for these men the sectional development of the Institute promises to be of peculiar value. By announcement cards, every section was kept informed of the progress of the other sections; so that each member knew just when any paper was up, and could go from one meeting to the other, and thus hear those subjects in which he was most interested.

The Manufacturing Section considered the following subjects:

1.—Refractory Materials.
2.—Oil-Tar Separation, Recovery, and Disposal.
3.—Coal-Gas Residuals—Feld Process.
4.—Operating Experiences under a Calorific Standard.
5.—Efficiency Relation Existing between Various Argand and Open-Flame Test-Burners.
6.—Operation of Inclined Retorts.
7.—Progress in Carbonization Methods.
8.—Carbonization in Bulk—Kopper's Ovens.
9.—Methods and Facilities for Specifying and Testing Blowers, also Measuring Air and Steam Supply to Water-Gas Generators.
10.—Measurement of Gas in Large Volumes.
11.—Purifier Installations.
12.—Care and Maintenance of Gasholders.

No. 1 was a brief account of the activities of a very hard-working committee which expects to accomplish much; No. 2 evoked much discussion, due to the increasing uses for tar; No. 5 led to a recommendation to the new officers for the adoption of the Carpenter burner as the standard test burner; No. 7 was a review of the year's carbonization progress, containing the first results from two intermittent vertical retort installations; Nos. 9 and 10 will be found of value to all interested in gas, air, and steam supply; No. 12 was a thought-provoking treatise which should be read by all who have to do with gasholders, and should result in decreased maintenance costs. The attendance varied from 67 to 296.

The Chemical Section offered the first opportunity ever given to gas chemists to discuss their specialty at a gas association meeting; and any criticisms of its programme should be made from this standpoint. It received the following:

13.—Gas Chemist's Handbook.
14.—An Electrical Process for Detarring Gas.
15.—A Method for the Determination of Hydrogen Sulphide in Gas.
16.—Tests of a New Recording Calorimeter.
17.—Separation of the Illuminants in Artificial Gas.
18.—Mode of Decomposition of Coal by Heat.
19.—Gas Manufacture from the Point of View of Physical Chemistry.

No. 13 is the beginning of what is hoped will be a book containing all the approved chemical processes used by gas companies. Its completion will afford ample scope for the chemists, and by itself would justify the section. Nos. 17, 18, and 19 were contributions from the Bureau of Mines—all tending to increase our knowledge of the processes and results involved in the conversion of raw gas-making materials into their various products. The thanks of the Institute were extended to the Bureau of Mines for these papers. The attendance in this section varied from 21 to 49.

The Distribution Section considered:

20.—The Welding of High-Pressure Mains.
21.—The Installation and Maintenance of Services.
22.—The Installation, Repairing, and Testing of Meters by a Small Company.
23.—The Improvement of Distribution Employees.
24.—The Proper Specifications for, and Inspection of, Interior Gas Piping.
25.—Piping Large Buildings for Gas.
26.—Utilization of Gas Appliances.

The discussion of No. 20 was increased in interest by the many illustrations given by Mr. D. E. Keppelmann of the use in San Francisco of autogenous welding for main, service, and meter work. The trend of the various remarks was towards welding as a requisite to tight high-pressure systems. No. 21 was more or less of an elementary treatise for the use of juniors; No. 23 called attention to the advantages possible from a better selection and education of the human element in distribution work; No. 24 directed notice to the need for adequate gas piping and the advantages of an Institute standard in this regard; No. 25 was a very long argument, accompanied by many exhibits, for the installation of gas piping in all buildings; No. 26 described the work of this standing Committee; and in the discussion the *pros* and *cons* of tagging standard ranges were advanced. In general, the manufacturers are anxious that each range made in accordance with the Institute's standard should be so marked. The attendance varied from 80 to 140.

The Accounts Section (also a new comer in the field) thoroughly justified its existence from the interest taken in its proceedings, which embraced:

27.—In Rate-Fixing by Commission, Should Depreciation be Deducted from Plant Valuation?
28.—Accounting for Depreciation.
29.—Compensation of Meter Readers.
30.—Printing and the Care of Printed Stock.
31.—A Suggested Extension of the Dewey Decimal Classification System to Gas Engineering.
32.—Rates.

Nos. 27 and 28 were discussed together; and the views on depreciation were so varied that after more than an hour of discussion the session ended with no time left for closure by the authors. No. 30 was a complete study of the subject, and the discussion testified to its value; No. 31 represented hours of thoughtful labour, and should serve as a starting point for a standard classification; No. 32 was an attempt to arouse new interest in an intelligent study of proper differential prices for gas. The attendance varied from 27 to 98.

The Illumination Section (a third new comer) in its one session listened to:

33.—Illumination.

34.—The Physical Installation of Gas Arcs.

No. 33 was a heart-to-heart talk on the present position of gas as an illuminant, and the ways in which its present advantages could be increased. The attendance varied from 26 to 85.

On Friday morning, the Institute met to act on any sectional recommendations and complete unfinished business. The Committee on the President's Address endorsed the proposition that the Institute should aid in issuing the digest of commission rulings. The Joint Committee on the International Gas Congress announced that Dr. A. C. Humphreys has been elected as President of the Congress; presiding officers of various participating societies to be Vice-Presidents. The Committee on the Beal Medal for the best paper read at the 1913 meeting was authorized to announce its award, when decided on, to the Board of Directors. Then, after proper acknowledgments to all who had contributed to the success of the meeting, adjournment was taken.

As has been said before, the keynote of the whole convention was the sectional meetings; and it was their differentiation of the Institute's activities that made the meeting the most successful one ever held. The average of excellence of the thirty-four papers and reports considered was in no way inferior to the average of those submitted two years or more ago, when, without sectional meetings, only one-third as many subjects could be covered. Again, this year, as last, the time allowed for discussion far exceeded that available in the old days; but with increasing practice, the membership is showing a willingness to talk that promises well for future meetings.

On the entertainment side, success was also attained. On Wednesday, in the afternoon, there was an organ recital for the ladies; in the evening, a reception to the President and Past-Presidents, attended by the members and their ladies. On Thursday evening occurred the annual banquet; one of the speakers being Mr. Arthur G. Glasgow, into whose words some war echoes quite naturally crept. The ladies went to the theatre; returning in time to hear many of the speeches. On Friday afternoon, a golf tournament cared for those on pleasure bent; while those who still longed for knowledge were shown portions of the new subways under construction, and the method employed in caring for gas-mains.

In addition to the above, all the pleasures and attractions of a great metropolis were at hand; and so efficient was the Committee on Arrangements, that praises were heard on every hand. Then once again perfect weather marked the meeting.

Royal Society of Arts.—The opening meeting of the 161st session of the Society will be held to-morrow week, when an address will be delivered by Colonel Sir Thomas H. Holdich, R.E., &c., the Vice-President and Chairman of the Council. Among the papers to be read after Christmas is one by Mr. H. M. Thornton, on "The Industrial Uses of Coal Gas." On Feb. 15, Professor Vivian B. Lewes, F.I.C., F.C.S., will deliver the first of three Fothergill Lectures on "Motor Fuel."

Southern District Association of Gas Engineers and Managers.—Members will assemble on Thursday afternoon at 3.30, at the Hotel Cecil, when tea will be served; the business meeting being arranged to begin an hour later. After the election of officers and new members, there will be submitted the report of the Commercial Section, and also one on the Education of Gas-Fitters. Mr. Samuel Glover will follow with a paper entitled "Studies on the Microscopic Sections of Coals;" and then there will be a discussion (to be opened by the President, Mr. Thomas Glover, of Norwich) on the position created by the war in the gas industry in the South of England.

The Late Mr. W. B. Bryan as a Gas Examiner.—In the account of the life-work of the late Mr. W. B. Bryan given in "Engineering" for the 31st ult., evidence is furnished of his connection with the gas industry as well as with that of water supply. It will be found in the following extract: "In 1875 Mr. Bryan became Borough and Water Engineer to the Corporation of Blackburn, though he retained until 1878 the post of Engineer to the Sewage Committee of Burnley. It was at one or other of these towns that an incident occurred which throws an interesting light upon the unfair pressure that public bodies sometimes impose on their technical advisers. In addition to his other duties, Mr. Bryan was asked to undertake that of gas examiner; the gas supply being in the hands of a company. During his term of office the Corporation acquired the undertaking without issuing any fresh instructions to their gas examiner. He, as in duty bound, reported shortly after the transfer the supply of bad gas, and was, in consequence, waited upon by a most indignant Committee, who instructed him that, now that the works were in the hands of the Corporation, bad gas was no longer to be reported."

TAR OILS FOR THE GERMAN NAVY.

The Secretary to the German Admiralty addressed a letter on the 5th of August last, to the German Association of Gas and Water Engineers, and to other bodies interested in the production and distillation of tar, in which it was pointed out that in the early days of mobilization there would be great restriction of ordinary railway traffic, and that, consequently, tar could not be freely despatched from gas-works to the distillers. Gas-works which had not sufficient storage accommodation for the tar thus held-up were requested to provide themselves at once with temporary storage tanks, such as cement-lined wells, in which the tar produced could be stored until the railways were again free to carry it to the distillers. It was pointed out that it was imperatively necessary for the preparedness of the navy that an ample supply of fuel oil should be available, and that all tar should therefore be kept for distillation.

The German Association forwarded a copy of the letter to each of the 1386 gas-works of Germany, with a request that during the continuance of the war all tar should be reserved for distillation and not disposed of for other purposes. The "Journal für Gasbeleuchtung" of the 22nd of August published the letter, and pointed out, in an editorial note, that gasholder tanks could be used as temporary storage tanks for tar without interference with the working of the holders. The tar would merely displace more or less of the tank water, and the thin coating of tar on the sides of the bell would do no harm.

Reporting on the tar trade on Sept. 26 last, the "Journal für Gasbeleuchtung" stated that it had been brought to a complete standstill since the beginning of August, owing to the German Admiralty having requisitioned almost all the stocks of tar. Small works, which despatch tar in barrels only, were, however, generally being freed from this requisition, and supplies from such works were again reaching the roofing-felt works. A few gas-works also which were unfavourably situated in regard to the transport of tank waggons to tar distilleries were being allowed to send away tar in tank waggons for general use. The roofing-felt industry, however, was suffering immensely from the diversion of large quantities of crude tar to distilleries which were working it up for fuel oil for the navy. The roofing-felt works might, instead, it was suggested, be supplied with sufficient tar for their needs, and the oils which they distilled off could be placed at the disposal of the navy.

In the issue of the same journal, dated the 10th of October, the German Tar Products Association say that the latter suggestion is impracticable, as the roofing-felt works are not in a position to produce fuel oil of the grade required by the navy, and, moreover, as the felt works are scattered all over the country, it would be difficult to collect the oil from them. During the war, though fuel oil is produced and sent away, large quantities of pitch, naphthalene, and anthracene remain over and cannot be disposed of. This circumstance would, the Tar Products Association state, suffice to shut-down the roofing-felt works and distilleries which have not sufficient storage accommodation for the unmarketable products.

FIRE CLAY GOODS, AND THEIR USE IN GAS-WORKS.

By Thomas Holgate, F.C.S., M.Inst.C.E.

The report of the Refractory Materials Committee presented at the last meeting of the Institution of Gas Engineers contains information so useful that it is desirable to examine some of it in detail; and it is proposed to do this before referring to other recent developments in the study of fire-clay goods.

The section of the report dealing with the effect of pressure on the depression of the melting point of a number of fire-clays contains a remark that the magnitude of such depression as found by Dr. J. W. Mellor was very surprising; and this surprise is doubtless shared by many of those at first brought face to face with the facts. When, however, the results of tests made in America in 1910 and 1911 are compared with those of the Committee, it is seen that the latter are not abnormal. The results of a study of Dr. Mellor's tests under load, in the light of those made by Messrs. A. V. Bleininger and G. H. Brown, are very instructive; and this study is facilitated by an extension and a re-arrangement of the two tables given in the report. Why there are two tables, or a classification of the fire-clays into two groups, is not stated; but the fact that the testing pressures are different in the two sets of itself requires this subdivision. There still remains, however, the question as to why one set were tested at 54 lbs. and 72 lbs. extra pressure, and the other set at 84 lbs. and 112 lbs. extra pressure, respectively. One must proceed in the absence of this knowledge, only pausing to remark that the comparison between the fire-clays would have been more strict if the test pressures had been more nearly alike in the two groups. Notwithstanding this drawback, there does appear a difference of behaviour as between the two groups; and therefore the division will here be retained.

In Table No. I the samples are given for each group in the order of the normal melting points, and the successive differences

TABLE I.—*Showing Effect of Successive Increments of Pressure upon the Melting Points of Fire-Clays.*

Group in Report.	Experiment No.	Melting Points.		Depression due to 54 lbs. Pressure.		Melting Point at 72 lbs. per Square Inch.	Depression due to 18 lbs. Pressure.		Depression due to 72 lbs. Pressure.		Computed Depression due to 84 lbs. Pressure.	
		At Atmospheric Pressure. C.	At 54 lbs. per Square Inch.	Total.	Per Lb. Pressure.		Total.	Per Lb. Pressure.	Total.	Per Lb. Pressure.	Total.	Per Lb. per Square Inch Pressure.
Group I.	12	1690°	1435°	255°	4·72°	1410°	25°	1·39°	280°	3·88°	297°	3·54° C.
	1	1650°	1435°	215°	3·98°	1380°	55°	3·06°	270°	3·75°	306°	3·64° C.
	2	1630°	1410°	220°	4·08°	1350°	60°	3·33°	280°	3·88°	320°	3·81° C.
	7	1580°	1380°	200°	3·71°	1350°	30°	1·66°	230°	3·19°	250°	2·98° C.
	Average	1637°	1415°	222°	4·12°	1372°	170°	2·36°	265°	3·67°	293°	3·49° C.
			At 84 lbs. per Sq. In.	Depression.		At 112 lbs. per Sq. In.	Due to 28 lbs. Increment.		Due to 112 lbs.		Due to 125 lbs.	
				Total.	Per Lb.						Total.	
Group II.	17	1770°	1520°	250°	2·98°	1410°	110°	3·93°	360°	3·21°	404°	3·23° C.
	9	1750°	1580°	170°	2·02°	1580°	nil	nil	170°	1·53°	170°	1·36° C.
	16	1730°	1460°	270°	3·21°	1410°	50°	1·78°	320°	2·86°	343°	2·74° C.
	4	1710°	1500°	210°	2·50°	1435°	65°	2·32°	275°	2·45°	305°	2·44° C.
	3	1690°	1460°	230°	2·74°	1380°	80°	2·86°	310°	2·77°	347°	2·77° C.
	10	1690°	1500°	190°	2·26°	1460°	40°	1·43°	230°	2·05°	249°	1·99° C.
	5	1670°	1460°	210°	2·50°	1380°	80°	2·86°	290°	2·59°	327°	2·62° C.
	11	1670°	1460°	210°	2·50°	1380°	80°	2·86°	290°	2·59°	327°	2·62° C.
	Average	1710°	1492·5°	217·5°	2·59°	1429·4°	63·1°	2·25°	280·6°	2·51°	309°	2·47° C.
No. of column.		1	2	3	4	5	6	7	8	9	10	11	12

due to the extra pressures are given. In order that the latter may be more comparable for the two groups, the further calculation has been made of the depression of melting point for each increase of 1 lb. pressure per square inch, and, further, the series of experiments on the first group at 72 lbs. per square inch have been computed to what they would be at 84 lbs. per square inch. The values at this pressure can then be compared with the corresponding ones for Group II. The computation just mentioned is based upon the depression of melting point being *pro ratâ* from 72 lbs. to 84 lbs., as experiment shows it to be from 54 lbs. to 72 lbs. The error in such an extension cannot be large; and it enables us to see that while No. 7 of the first group and No. 17 of the second group are identical in the depression of 250° at 84 lbs. per square inch, all the others in the second group are below the remainder of the first group. This fact ought not to escape notice, because No. 17 of the second group "is the typical china clay of first-class quality, used for the purpose of comparison." We shall see at a later stage that although this clay has the highest normal melting point of both groups—viz., 1770°—yet it has the greatest depression of all the clays in the second group for the 112 lbs. pressure per square inch series of tests. Further, in the first group, clay No. 7 had the lowest normal melting point—1580°—and the lowest depression of all the clays in the first group for the 54 lbs. series and the 72 lbs. series.

It is a case of comparisons where extremes meet—*i.e.*, the clays of highest and lowest normal melting point are alike in the depression at 84 lbs. pressure per square inch—namely, 250°C. Another noteworthy contrast is furnished by this standard china clay when compared in the behaviour between 84 lbs. pressure and 112 lbs. pressure. As shown in Table I., column 7, No. 17 suffers the large depression, due to this increment of 28 lbs. per square inch—viz., 110°, by far the largest of any in groups one and two; while the next in the list, in order of normal melting point—viz., clay No. 9—has no depression due to this increment. If we may be sure that the report does not in this particular involve a misprint, then the fact disclosed is quite an important one, not only by its exceptional character but by the complete contrast with its neighbour. Column 10 shows us that for the second group we have in these members the extremes of the group—viz. 3·21 maximum and 1·53 minimum depression—with a difference of only 20° in the initial or normal melting point. The consequence of the variation in the rate of depression is that under 112 lbs. pressure No. 9 is easily first, with 1580° melting point, and No. 17 is down next to the lowest with a melting point of 1410°, although the initial melting points were in the inverse order—viz., 1750° and 1770° respectively.

Another important difference in behaviour is presented by the relative falling off of the depression for the higher pressures. In the first group this is so throughout, but in two different degrees, seen by comparing Columns 5 and 8. The values of Column 8 are all lower than those of Column 5. Two of them, however, are very much below; while the two remaining are only reduced about 23 per cent. In the second group this falling off is, on the average, from 2·59° to 2·25° per pound pressure; but this average is made up of four cases on the side of increase, and of four on the side of decrease. These contrasts include the two already noticed, where the 28 lbs. increment is in one case *nil*, and the other 3·93°—the greatest per pound pressure of all in the second group.

It must be noted that in the second group, clays Nos. 5 and 11 give identical results throughout the melting point tests—a parallel so exact as to be worthy of a detailed investigation into the chemical composition of the two clays—and No. 3 differs therefrom only in having an initial melting point 20° C. higher. Table I. reveals a general tendency towards equality of melting point under applied pressure; the outstanding exception to this rule being No. 9, the notable member of the second group. It cannot be doubted that these deviations of melting point from the normal must have an important bearing on practical work in the use of fire-clay goods; for the pressures employed in the tests must be experienced in many retort-settings.

Having seen how important are the contrasts presented by these tests of British clays, it is desirable to compare the data with the conclusions reached by Messrs. Bleininger and Brown on American clays. It may be said at the very outset that the two are not at variance, and that they show many of the British samples to come out relatively high. Messrs. Bleininger and Brown recognized that, however valuable may be the knowledge of the melting point of a fire-clay when tested under atmospheric pressure only, this was not of itself sufficient, but should be supplemented by tests made under conditions more nearly those of actual work. They therefore made tests of melting points under 50 lbs. pressure per square inch, and in others varied the pressure while exposing the specimen to 1350° C. (2462° Fahr.)—something like ordinary furnace conditions. They found that these tests revealed behaviour in fire-bricks that could not have been foreseen from the normal melting point test or from the chemical analysis. They found that the fluxes, the RO constituents, including ferrous oxide (FeO), should not exceed 0·22 molecular equivalent; also that while the content of silica in relation to fusibility was important, that of the fluxes was still more so. For it was the amount and fusibility of the least refractory constituent that governed the behaviour of the brick under load.

A number of tests were made by them keeping the temperature at 1350° C., and noting the effect of successive pressures. With 50 lbs. per square inch, the bricks being placed on end, no fire-brick body could be found to withstand the 1350° C., if the alkali equivalent be more than 0·225. Indeed, when silica was present in excess of the ratio "Alumina (Al_2O_3) : 2 Silica (SiO_2)"—that existing in kaolin—the alkali content was more effective in fluxing power. Thus, with 4·4 SiO_2 per molecule of alumina, failure under the load was brought about by 0·17 equivalent of RO. Experiments at other pressures showed that most fire-bricks fail under 125 lbs. per square inch when heated to 1350° C. The highest pressure in the experiments of the 1914 report of the Refractory Materials Committee is 112 lbs. per square inch, and by graphical methods this may be extended to see what is likely to occur at the 125 lbs. found to be the maximum for American clays.

The extension referred to has been carried out by assuming the depression of melting point beyond 112 lbs. up to 125 lbs. to be proportionate to that shown by experiments from 84 lbs. to 112 lbs. per square inch. Only the clays in the second group were tested at 112 lbs.; and these are dealt with in Table II.—see p. 294.

The figures in the last column, computed from the experimental values of Dr. Mellor, in the report, show that all would have stood the critical pressure and temperature formulated by Messrs. Bleiningen and Brown. The figures for clays Nos. 3, 5, and 11 are identical at 1343°, which may be taken as complying with the rule; while china clay No. 17, notwithstanding its great yield to

TABLE II.—*Showing the Approximate Melting Point of Clays, under a Pressure of 125 lbs. per Square Inch.*

No. of Clay in Committee's Report.	Melting Points Found by Experiment.			Computed for 125 lbs. Pressure from the Three Preceding Columns.
	Normal.	84 lbs.	112 lbs.	
	C.	C.	C.	C.
No. 17 . .	1770°	1520°	1410°	1366°
,, 9 . .	1750°	1580°	1580°	1580°
,, 16 . .	1730°	1460°	1410°	1387°
,, 4 . .	1710°	1500°	1435°	1405°
,, 3 . .	1690°	1460°	1380°	1343°
,, 10 . .	1690°	1500°	1460°	1441°
,, 5 . .	1670°	1460°	1380°	1343°
,, 11 . .	1670°	1460°	1380°	1343°

pressure, comes out as 1366°, followed in the scale of rising temperatures by No. 16 at 1387°, No. 4 at 1405°, No. 10 at 1441°, and culminating in the remarkable clay No. 9 at 1580° C. Group II. thus comes out of the inquiry most favourably.

Group I. does not seem likely to emerge from the investigation nearly so well. It is not so easy here to arrive at the melting points for a pressure of 125 lbs. per square inch, because the highest experimental pressure was 72 lbs. per square inch, so that the extension would be more conjectural. Making it on the basis of adding four times the depression due to the increment of 18 lbs. per square inch to the depression found for 54 lbs., we get a computed depression for 126 lbs.; and the melting points for this pressure come out at 1335° C. for No. 12 clay, 1260 for No. 7, 1215° for No. 1, and 1170° for No. 2. Thus three out of the four specimens appear as though they would have failed to reach the critical standard set up, although they would have stood less severe furnace conditions—viz., 2300°, 2219°, and 2138° Fahr. respectively. These last values are given on the Fahrenheit scale for convenient comparison with gas-works practice, and show that such bricks would probably answer satisfactorily in gas-producers, although not reliable for combustion chambers in present-day retort-settings.

Before leaving the 1914 report, attention must again be drawn to Table II., where in the second group it is shown that Nos. 4, 3, 5, and 11 are clays which behave thermally almost proportionally at 112 lbs. per square inch as they do at 84 lbs. pressure. These apparently normal features are seen to be in contrast with Nos. 10, 16, and 9, on the one hand, and No. 17 on the other.

(To be continued.)

MOTOR FUELS IN WAR TIME.

[COMMUNICATED.]

THE great war has thoroughly upset many things, not only in the belligerent but also in the neutral countries. Among these things we may certainly include the question of motor fuel, as in many circumstances motor-cars are also implements of war, the fuel for which has been taken in large quantities by the respective Governments. Up to now the greatest part of the motor fuel has been petrol spirit of varying specific gravity; and the great danger in its use is that it comes from distant countries, as its chief producers are the United States, the Dutch Indies, and Roumania. Owing to this situation, the chief route for the supply of this fuel is the open sea. In times of peace there is naturally no obstacle in the way of supply; but in war times matters are totally different. As the motor traffic has developed considerably during the last few years, the consumption of spirit has been very large, and stocks were not abundant on the Continent. In Holland there is no danger, as the central refining plant of the Royal Dutch for the petrol spirit from the Indies is situated in Rotterdam, and there are naturally large stocks there; so that motor traffic in Holland goes on as usual. Only the export of the spirit is prohibited, as it is with all liquid and solid fuel (including coal and coke). Quite different it is, for instance, in Switzerland; for, as we learn through the Press, there is such a small stock of motor fuel that it is not even sufficient for the military motor-cars.

In Germany all motor spirit is taken by the Government; and this was also the case with all available benzol. Subsequently, however, part of the benzol was given free, conditionally. Private motor-cars are not now allowed to use petrol spirit; and only physicians' cars and Red Cross motor vehicles obtain their daily requirements from the stocks held by the Government. There were still small quantities of petrol spirit stowed away in druggists' shops, where people bought it in bottles for removing grease, &c., from clothes. But it was very quickly sold at the rate of about 9s. a gallon. It therefore became an important question as to how other workable motor fuels might be produced from materials available in sufficient quantities in the open market.

In these circumstances, the first thing to do was to resort to alcohol. Germany is a large producer of alcohol, made chiefly from potatoes; and in 1913 the production amounted to about 83 million gallons. For many years the Germans have tried to introduce this alcohol as a motor fuel for cars, but so far without noticeable success; and the greater part of it has been used for ordinary consumption. The war has brought a change in the alcohol question, for the owners of motor-cars and the taxi-cab companies have been obliged to make use of this fuel for driving their cars; and it may be said that the success is practically complete.

When we compare the calorific powers of the different combustibles applicable to motors which are now in use, we find that petrol spirit and benzol have by weight almost the same power; but the commercial 95 per cent. alcohol has only 60 per cent. of the calorific power of benzene. Therefore the consumption of alcohol has to be so much greater to obtain the same mechanical effect. In order to raise the calorific power, there have been prepared mixtures of alcohol with other fuels of higher heating value, more especially benzol and naphthalene. Prescriptions for these mixtures which are found generally to give great satisfaction in practice are as follows:

(1) Four gallons of 95 per cent. alcohol, 1 gallon of 90 per cent. benzol, and 2 lbs. of naphthalene. The mixture is limpid. In place of the 90 per cent. benzol, there may also be used crude benzol, as well as the total light oil fraction from coal tar. But the benzol or light oil must be previously washed with sulphuric acid and alkali to remove the sulphur and other impurities. Running trials have proved that 4 gallons of this mixture will allow as many miles to be covered as 3·6 gallons of petrol spirit.

(2) Alcohol (95 per cent.), 7 gallons; benzol, 3 gallons. [For the latter may be substituted petrol spirit of ·7 sp. gr.]

(3) Alcohol (95 per cent.), 9 gallons; ethylic ether, 1 gallon.

(4) Alcohol (95 per cent.), 90 parts; ethylic ether, 10 parts; naphthalene, 1 part.

(5) Kerosene, 90 parts; ethylic ether, 10 parts; naphthalene, 1 part.

In order to prevent rusting, it is necessary to add to every gallon of the above-mentioned mixtures 1·5 fluid ounces of spindle oil or some other fine motor grease. These mixtures are higher in price than the motor spirit generally used; but when there is no choice, it is better than to have no fuel at all.

There are several matters to be considered. First as to the starting. Alcohol does not evaporate so easily as petrol spirit, and there is consequently great difficulty in starting the motor when cold. The best thing is to have a small storage tin of light motor spirit, and connect it by a tiny tube to the end of the fuel-feeding tube. The motor is then started with pure petrol spirit, and when running the alcohol mixture is admitted and the petrol spirit stopped. Then there are the air supply and the carburettor. Where the motor is to be run with alcoholic fuel or with heavy spirit up to kerosene, it is advisable to use the heat of the exhaust gases for preheating not only the air but also the fuel.

THE COMPOSITION OF COAL.

IN a further paper on this subject, Messrs. D. T. Jones and R. V. Wheeler ["Chemical Society's Transactions" for October] give further particulars of the liquid distillates obtained up to 350° C. (662° Fahr.) by the distillation of coal in a vacuum.

It was noticed in the previous experiments that these liquid products agreed as to their composition with corresponding oils distilled at 430° C. These latter amount to about 6·5 per cent. by weight of the original coal, and yield, at 300° C., about 50 per cent. of pitch. The oils distilling below this temperature consist of 40 to 45 per cent. of unsaturated (ethylenic) hydrocarbons, about 40 per cent. of naphthalenes and liquid paraffins, 12 to 15 per cent. of phenols, and about 7 per cent. of aromatic compounds.

In the experiments here quoted the yield of tar and oils at 350° C. was 1·25 per cent. of the weight of coal. The tar had a density of ·9639, and contained some catechol. The oil (which had been kept cool throughout the distillation) had a density of ·8358. The water that separated in the oil receiver contained hydrochloric acid, as was the case with the same coal distilled at 430° C.

The mixed tar and oil contained 17 per cent. of phenols; and, after the usual method of purification, it lost 44 per cent. by volume to concentrated sulphuric acid—due to the removal of olefines; while further treatment with nitric and sulphuric acids effected a further reduction in volume of about 6 per cent., due chiefly to the removal of the aromatic hydrocarbons. The oil remaining—after washing, drying, and distillation from sodium in a vacuum—consisted chiefly of naphthenes. The presence of naphthalene was proved by the formation of a picrate with picric acid.

Combined Gas and Steam Plants.—The Ford Motor Company are erecting at their factory at Detroit a combination gas and steam plant. There will be four "gas-steam" units, each consisting of a two-cylinder gas-engine of the four-cycle double-acting type, arranged in tandem, and also a tandem compound condensing steam-engine. These two different types of engines will be connected to one shaft similar to the arrangement employed in a cross compound steam-engine. Electric power will be developed by connecting directly on the engine-shaft a generator of 3750 kilowatts capacity. The combination has been adopted to secure the economy of a gas-engine and the reliability of a steam-engine. With this arrangement, the steam-engine is not supposed to be put in service, unless there is a half load or more; hence the gas side will always be fully loaded. In case of trouble on this side, the other can deal with the entire load with a late steam cut-off.

SOCIETY OF BRITISH GAS INDUSTRIES.

The Autumn General Meeting of the Society was held last Wednesday, at the Trocadero Restaurant, Piccadilly Circus, W. Owing to the war, there was not the usual dinner in the evening; but instead the members had luncheon together before the business meeting commenced. It was a large and representative gathering of all interests, over which Mr. J. W. BROADHEAD, M.Inst.M.E., presided. The President (Sir Alfred Keogh, K.C.B., LL.D.) was unable, through the cause explained at the business meeting, to be present; but the members had the pleasure of welcoming their first Past-President (Mr. Dugald Clerk, F.R.S., D.Sc.). After the luncheon, the members drank to the health of His Majesty the King, and success to the military and naval forces.

The Business Meeting.

There was no waste of time. Directly luncheon was over, the members adjourned to a neighbouring room for the transaction of business. The Chairman (Mr. Broadhead) was supported by most of the members of the Council.

APOLOGIES FOR NON-ATTENDANCE.

The CHAIRMAN announced that the Secretary had received several letters from gentlemen unable to attend. They had, among them, communications from their Past-Presidents Sir Corbet Woodall, D.Sc., Professor Arthur Smithells, F.R.S., and Mr. Balfour Browne, K.C. In expressing regret for his absence, Mr. Balfour Browne said he was sorry to be unable to accept the invitation to be present, and he added: "I have the kindest feelings for your Society, and wish it every prosperity."

RELIEF FUNDS.

The CHAIRMAN also announced that at the Council meeting that morning, they had voted £5 5s. to the Prince of Wales's National Relief Fund, and £5 5s. to the Belgian Relief Fund. He did not think the rules of the Society covered a matter of this kind; and this was why he mentioned it at the meeting of the members. The amounts voted were small. But their funds were not large; and their members, he took it, had individually supported these very desirable funds.

SOME NOTES ON RECENT TRANSACTIONS.

The CHAIRMAN said he proposed to read some notes on what had transpired of interest to the members since the last annual meeting.

SIR ALFRED KEOGH'S ABSENCE—ACCEPTANCE OF THE PRESIDENCY FOR A SECOND YEAR.

To begin with I have to apologize for the absence of our President (Sir Alfred Keogh, K.C.B., LL.D.), who is prevented from being with us to-day owing to the duties undertaken by him in the interests of our country as Director-General of the Army Medical Service. He writes:

> I very greatly regret that the routine of my duties here [at the War Office] will prevent my being present at the autumn general meeting and the luncheon on Nov. 4. This is a great disappointment to me, because I recognize freely how kind the Society has been to me, and how indulgent. I can assure your Council that nothing but the very exacting duties which have fallen to me would have kept me away. Will you very kindly ask the Chairman to apologize on my behalf for my absence, and to express my extreme regret.

Our Society feel honoured in having so distinguished a gentleman as our official head; and, in the circumstances, of course, we gladly excuse him, and wish him health and strength to carry through his very arduous duties.

While speaking of our President, it will be of interest for you to know that, following the practice of many Societies in this country, your Council, looking ahead, have asked him to continue his presidency for another twelve months; and he has kindly accepted. [The Chairman read Sir Alfred's letter.] I feel sure that this acceptance will give all our members pleasure, and that we shall welcome his re-election at our next annual meeting. We all trust that, before his term of office expires, he will have ample opportunity of preparing his promised address.

CALL TO THE COLOURS AND FULFILMENT OF CONTRACTS.

A majority of our members are no doubt placed at great inconvenience through loss of employees who have joined the Colours. I am sure that no one has welcomed such inconvenience more than our members; and I hope that your experience has been that clients have been very indulgent when, through this cause, the completion of contracts and orders has been delayed. We, of course, all hope that the result of this warfare, when satisfactorily settled, will be lasting peace with greatly increased trade all round.

THE DEATH OF MR. NEWBIGGING.

Since last we met we have to deplore the death of one of our Past-Presidents—Mr. Thomas Newbigging—a name which will live as long as the gas industry exists. He was one of our best friends, and one who honoured our Society by becoming its President.

THE SOCIETY'S CONTRIBUTION TO THE NATIONAL GAS EXHIBITION.

You will have had a circular from Mr. Dunn, the Hon. Secretary of the National Gas Exhibition, *re* the deficit of £3500 in connection with last year's National Gas Congress and Gas Exhibition, in which they ask us for additional assistance to enable the shortage to be wiped out. Your Council in reply thereto sent a letter. [The Chairman read the letter, which pointed out what the members of the Society had done, and referred to the fact that a large number of gas undertakings had not contributed at all.] The statement of accounts shows that while the gas undertakings subscribed £12,207, which was supplemented by a contribution from the Institution of Gas Engineers of £1000, making £13,207, our Society subscribed £13,469, supplemented by contributions from coal owners and factors of £1642, making a total of £15,112, or nearly £2000 more from our Society and the trade than was contributed by the gas undertakings. Since these figures were furnished, the British Commercial Gas Association have contributed £1000, and other gas undertakings have sent further contributions—reducing the deficit to about £2200. I think you will all agree that our Society has done its share, especially when we remember the fact that the gas undertakings reap, and will continue to reap, the greatest advantage to be derived from such exhibitions. It is very disappointing that about a thousand gas undertakings have not subscribed anything, of which number 370 have an annual make of 10 million cubic feet and over, and fourteen making over 100 millions annually. It seems to me that some big effort should be made by the Institution of Gas Engineers to get these gas undertakings to come into line. Nevertheless your Council, while exercising no pressure whatever on the subject, will be pleased to receive voluntary additional contributions from our members in order to assist the Exhibition Committee to meet its liabilities.

THE CONTRIBUTION TO THE "B.C.G.A."

With regard to the British Commercial Gas Association, when this was formed we were asked to subscribe, and pledge ourselves to do so for a period of three years. It will be of interest to you to know that our first year's subscriptions amounted to £2115; our second year's subscriptions, to £2289; and the present year's subscriptions, to £2378. I think you will agree that we have had, and are having, value for our money; and I feel sure that this Association is worthy of still greater support from our Society. I am convinced that the more money we subscribe, the greater will be the consumption of gas, and with this the prosperity of our respective firms. I feel justified, therefore, in asking you, one and all, to see, even in these troublous times, if you cannot increase your subscription, and do your best to keep business going "as usual." I trust that those who have not up to the present subscribed at all, and any who have only half-heartedly supported it, will reconsider their decision, and help along a very good cause. I might say that now every subscribing member is entitled to a vote at the annual meetings of the British Commercial Gas Association.

RULES AFFECTING THE COUNCIL.

You have, on several occasions, voiced the opinion that the "personnel" of your Council should change more in the future than has been the case in the past. Effect was given to this feeling at the last election of Chairmen of sections. But to prevent the possibility of a similar complaint in future, you were told at the last annual meeting that our rules would be revised with this object in view; and it will no doubt be of interest to you to be told now that at our next annual meeting your Council will ask you to pass certain alterations. At the end of Rule XI., the addition of these words is proposed:

> No member can serve as Chairman of a section for more than three consecutive years, but shall be eligible after an interval of one year.

At the end of Rule XII., it is proposed that these words shall be appended:

> No member can serve in such capacity for more than three consecutive years, but shall be eligible for election after an interval of one year.

In the course of Rule XIII., it is proposed to insert the words:

> With the exception of the senior elective member, who will be eligible for election at the next annual meeting.

In addition, two new clauses will be submitted as follows:

> The Chairman of the Council for the time being shall be nominated as a Vice-President of the British Commercial Gas Association, and hold that office from the date on which the Association appoint Vice-Presidents until the next annual period of election.
>
> One member of the General Committee of the British Commercial Gas Association shall retire annually by ballot.

OTHER SUBJECTS AND THE WAR.

Owing to the war, the officials of the British Commercial Gas Association have been elected *en bloc* for the ensuing year.

Your Council have had several important subjects in hand which, after much time having been spent on them, have, owing

to the war, been suspended. Among these are: (1) The Railway Commission, (2) Local Government Departmental Committee's inquiry on smoke abatement; also (3) London Chamber of Commerce inquiry regarding the conditions of Government and other contracts.

The British Engineers' Association have sent out a circular asking (among others) this Society to support them in their efforts to have the proclamation which has been made as to trading with the enemy made more drastic; and your Executive have agreed to work on the subject in conjunction with the Institution of Gas Engineers and the British Commercial Gas Association.

We have refused an application to officially support the Bakers' and Confectioners' and the Grocers' Exhibitions, and think this will meet with your approval.

LIFE OF GAS-METERS, AND GAUGING OF GASHOLDER SHEETS.

An appointment has been fixed for a deputation of our Society to meet an influential one of the Institution of Gas Engineers later this week to consider the question of the present methods of manufacture and distribution of gas on the life of gas-meters, from which we trust good will result.

A deputation of gasholder makers met with a favourable reception from a Sub-Committee of the Institution of Gas Engineers, with regard to the gauging of sheets and rolling margins to be allowed; and we have received all the concessions that we asked for. New clauses embodying them will be added to the standard clauses of contract, particulars of which will be sent out without delay.

PRIZES TO STUDENTS.

The Society's prizes to students in connection with the City and Guilds of London Institute Examinations in Gas Engineering and Gas Supply have been awarded as follows:—

Gas Engineering—Honours Grade.

1st Prize, £3 3s. Mr. Tom Rudge, Assistant in the Stafford Corporation Gas Department.
2nd Prize, £2 2. Mr. John William Jones, Assistant in the Wilmslow and Alderley Edge Gas Company.

Gas Supply—Honours Grade.

1st Prize, £3 3s. Mr. Tom Rudge.
2nd Prize, £2 2s. Mr. James Lawrence Page, Assistant in the Wandsworth works of the Wandsworth, Wimbledon, and Epsom Gas Company.

From acknowledgments received, these prizes are much appreciated. We are pleased to congratulate Mr. Rudge on his dual success.

The Chairman, in concluding his report, remarked that, as a Society, the members all felt that, while they aimed for the success of the gas industry as a whole, they realized that closer co-operation was necessary; and it behoved them to be watchful over their respective interests. They recognized that their customers were in a great degree the gas companies and the corporation gas departments; and they desired their support wherever possible. Indeed they would ask for full reciprocity, and that the gas undertakings would place their orders with home industries, not only now, but would continue to do so when this unfortunate war was over, thereby binding up in even closer sympathy the two units—viz., buyers and contractors. The Chairman added: I shall be glad to have your observations on this report.

Mr. Thomas Marsh (Manchester) said there was one point in the remarks of the Chairman which came nearly home to him; and he would like to bring it forward at this meeting. He believed he was addressing the members as Britishers; and, if they were Britishers, he was sure it was not only their intention to keep to the letter of the law, but to the spirit of it. The previous week one of the firms he was connected with had a letter from Holland, saying it had come to the writers' notice that the firm were large purchasers of mantles. The letter stated that the writers had mantles in stock, and could supply any quantity desired, at a price named. Samples were sent. It seemed rather peculiar to him that the writers of this letter should know approximately the number of mantles his firm purchased in a year; and what was also peculiar was that the price quoted was absolutely the same as they had been paying for mantles in Germany. When the sample mantles came, they were examined, and found to be absolutely identical with those formerly purchased from Germany. He therefore asserted that the mantles offered from Holland were made in Germany; and not only the mantles, but the boxes. He asked the members to keep to the spirit as well as the letter of the new law which had been promulgated as to dealing with the alien enemy. He had written to the Home Office, and had sent them particulars of this incident, and attempts to get indirect trade with Germany. It would have paid him to purchase these mantles offered from Holland; but money was not now the question for Britishers. Great Britain had to come out on top, and out on top it would come, if it took twenty years to accomplish.

Mr. J. William Glover (London), in moving the adoption of the report, said he thought it was very satisfactory.

The Vice-Chairman (Mr. F. Templer Depree, J.P.), seconded the motion. He remarked that the report showed that the Chairman had given a large amount of attention to the work of the Society. Every important matter which had been dealt with by the Council had, through the instrumentality of the Chairman, received the fullest possible consideration. There were one or two points which, owing to the present condition of affairs, they had thought it necessary to allow to stand over for a time; but at the several important Council meetings that had been held, he did not hesitate to say they had obtained from their Chairman assistance and advice of immense value.

The report was unanimously adopted.

THE YATES GOLF CUP.

The Chairman said it gave him pleasure to present the Yates golf cup to this year's winner. For the competition for the cup, they had a very pleasant gathering last July. If the members only knew what a pleasant picnic and function it was, they would all make an effort to give up this one particular day to golf. The cup was won by Mr. Joseph Clayton, jun.; and he had pleasure in presenting it to him to hold for one year, together with a handsome replica for permanent possession. [Applause.]

Mr. Joseph Clayton, jun., said he had great pleasure in accepting the cup and replica which the Chairman had presented to him on behalf of the Society. He should like to take this opportunity of inviting the members to play on the course of the Leeds Golf Club next year. They had a good course, pleasant surroundings, and he could promise the members a most enjoyable day.

The Chairman remarked that the members would be glad to bear Mr. Clayton's suggestion in mind. But it was the practice of the members to visit the Chairman's golf club; and therefore they might have next year to journey to Exeter.

THE CHAIRMAN'S ADDRESS.

Gentlemen,—I propose to-day to address you generally upon topics that appear to me to be of interest, rather than to submit a set paper upon one specific subject. I also propose that all matters contained in the address shall be quite open to discussion, as in the case of the papers submitted from time to time by my predecessors in office.

There is some little difficulty in selecting subjects for an address to members of our Society, who are also trade competitors, as compared with gas manufacturing engineers, who have a practical monopoly in their own respective towns, and are free to impart fully to others what they are doing and the reasons therefor.

In claiming your attention for a little while, one is alive to the fact that he is addressing himself to a body of men comprising a great variety of individual interests, but which are all incidental to, and interwoven throughout with, the great gas industry of this country; and while each of us has his own particular end in view, we all are of necessity working to the one end, and interdependent one of another.

While, therefore, keeping in view the mutuality of our aim and objects, along with that of the gas industry itself, I trust you will bear with me if my remarks are directed from my own point of view as a member of what has come to be known as the "Heavy Section," and based more particularly upon my own experiences and observations such as (say) in the growth and development of carbonizing methods from the days of direct-fired hand-charged horizontal settings, through various stages of development to the more refined methods now coming into vogue.

The growth in this, the generating, portion of gas manufacturing operations has been little less than phenomenal since the set-back caused by the advent of water gas was overcome.

It is interesting in this and other departments of gas manufacture to note the extent to which gas manufacturing engineers and contracting engineers have supplemented each other's efforts in initiating and perfecting the various improvements effected from time to time; and I think it is but common justice in this regard to put forth a claim for recognition of the work of contracting engineers and others in contributing no mean portion towards the advancements made—to say nothing of the large sums of money frequently spent by them in pioneer and experimental work.

I would not for one moment wish to detract from the credit due and accorded to many gas manufacturing engineers for their part in initiating important and far-reaching departures, as in the realm of carbonizing—for instance, such as West, Coze, De Brouwer, Fiddes, Woodall, Glover, Bueb, Settle, and others; but it certainly ought not to be forgotten that much of the detail work of forging many of these propositions into practicable plant and apparatus, and many of the developments and refinements subsequently effected, are due, in large measure, to the wider and more varied experience, and more continuous application, of the contracting engineer.

The success of the gas industry follows the fortunes of the retort-house as much to-day as ever before; and the revolution in carbonizing methods now in progress cannot fail to grip the imagination of all throughout the ranks of the industry.

Twenty-five years ago the bulk of gas was produced in direct-fired hand-charged horizontal settings. Then followed generators and regenerator settings, and charging and drawing machinery. Next came the inclined retort system, using gravity to facilitate charging and discharging; and when this system, in course of time, was perfected, the millennium was thought to have been reached.

Stoking machinery on one side of the bench, however, came along—giving such increased results from horizontals as to call a pause, and such as to practically put a stop to extensions on the inclined system owing mainly to the smaller capital outlay involved by the improved horizontal working.

During this time the rapidly increasing use of the incandescent mantle (which to-day is practically universally adopted), with the rise in the price of coal, accompanied by a proportionate decrease

of best gas-making coals, rendered the high candle power gas of previous days unnecessary, resulting in gradual candle power reduction, till to-day calorific value is being substituted.

This state of affairs, along with higher labour costs, &c., prepared the way for the advent of the vertical retort. On the Continent, where these conditions were in operation at an earlier date than with us, the vertical retorts on the intermittent system first demonstrated their value as efficient gas producers. Eight years ago this country possessed not a single representative vertical retort plant on a practical scale. To-day it has about one hundred and fifty installations of various types. This phenomenal development is, to say the least, amazing; and, since nothing "succeeds like success," one wonders what the next eight years may show.

Vertical retort carbonization took the industry by storm, as its introduction dispensed with much of the hot, dirty, and arduous labour of stoking, reduced the number of men for a given output, diminished to a negligible quantity the bugbears of naphthalene and stopped ascension pipes, and gave approximately a 10 per cent. all-round increase in yields over the horizontal retorts of the period.

Such an advance warranted the universal application of verticals; but, like all good things, the factors constituting success were soon "flattered by imitation," so that horizontal retorts nearly filled with coal and fitted with improved stoking machinery so as to accommodate these heavy charges of long duration, and improved coke-handling devices, developed until horizontals actually caught up the earlier forms of vertical retorts, in all save cleanliness and labour costs, and again held their own when capital expenditure was taken into account.

But as horizontals have been making up leeway, new systems and developments of existing types of verticals have sprung into being, far ahead of their forbears. The pace is thus quickened; and the problem of choice of plant grows apace. But the general rule to-day may be said to be: Where a new site exists, verticals are put down; where housing, &c., are extant, horizontals hold their own.

The exceptions which prove the rule are the relatively few large horizontal installations being constructed on new sites. The fact, however, that the machinery employed is of the simplest character, and fewer men are required (which in these days of labour unrest is a very important point), assures, in my opinion, a monopoly for vertical retorts in days to come.

The two principal vertical systems—viz., the intermittent and the continuous—have advantages and disadvantages as compared with each other; and so long as we have a variety of coal to deal with, of both a caking and a non-caking character, a choice of retorting is an essential. Consequently, both systems will find adherents according to the requirements.

The intermittent retort (completely filled and emptied) gives a dense, hard, large size of coke. The continuous retort gives a softer, less dense, and smaller size of coke. The continuous possesses a charm all its own. The coal enters without dust or smoke; slowly gravitates through zones of heat; then gradually cools; and finally emerges as dry, cold coke, ready for the consumer. In fact, at one installation, the consumers' carts back underneath the retorts, and the coke falls direct from the retort to the cart—thereby obviating breakage, handling, and storing of coke, which fact is probably unique in the industry.

The intermittent is, generally speaking, comparable with the continuous retort, except that it produces some dust during charging, some fumes during discharging, and steam during quenching. It has a wide field of application; and my experience leads me to form the opinion that the intermittent system is applicable over a greater range of quality of coal than is the continuous, as, while we have not experienced trouble with any coal used in intermittent retorts, we have met with coals of a highly bituminous nature that could not be persuaded (except with great trouble) to pass through continuous retorts.

In selecting the type of plant, the size of unit is often the deciding factor. This ought not to be, as verticals lend themselves to subdivision of the setting, so that half of a unit (or less) can be at full work, and the remainder cold and inoperative; and since the larger the unit the greater the prospects of efficiency, gas manufacturing engineers should look to future developments and growth and select a unit in excess of present needs, and thus prepare themselves for future requirements.

Larger units can be installed with verticals than with horizontals in similar sized works, also because of their greater flexibility. Intermittents can be worked in nine, ten, eleven, or twelve hour periods with advantage, and without much variation in efficiency. With continuous retorts a like flexibility is obtained by adjusting the extractor mechanism—giving an efficiency to the smaller works hitherto possessed only by larger works.

An impression has grown up that very high temperatures are a necessity in connection with vertical retort carbonization, and that a specially high refractory material is an essential. That this is not so is proved by the comparatively low published temperatures at which vertical retorts are worked.

A vertical retort being placed on end is stressed as a column; and, in order to discharge freely and automatically, the retort must retain its true shape to a greater degree than a horizontal retort. Hence the need of a higher grade material to provide stability, and not of necessity to resist extreme temperatures.

The question of refractory materials is at present receiving much attention, as it rightly deserves. The manufacturers, however, require to keep a level head, as the power to withstand carbonizing heats is but one factor of their problem. The texture of the material must first be firm, to withstand the shocks of the railway, &c., transit to the site; the material when built must have the minimum of expansion on being heated, and must not shrink under continuous application of heat; and the surface of the material must remain smooth so as to minimize the adherence of scurf, and must be strong to facilitate its removal. The material must likewise be proof against any sudden changes of temperature, and against the action of a percentage of salt found in some coals; and last, but not least, it must possess the highest factor of heat conductivity possible in conjunction with the above array of necessary features. Truly a formidable problem, but one gradually succumbing to constant application!

Just as the "strength of a chain is the strength of its weakest link," so is the stability of a setting dependent on the refractory properties of its weakest bricks. Hence too much care cannot be bestowed in the blending of the clays in order to obtain this uniformity under working conditions.

There is sufficient good fireclay and silica in this country to meet all requirements. Nor is there any necessity to go abroad for any constituent part. The reverse is really the case, as Continental manufacturers in normal times import largely from this country to enable them to produce the excellent goods for which they are reputed. What is really wanted is a more scientific method of analyzing, preparing, grading, mixing, &c., to ensure uniformity of quality.

The relationship of temperature limits, carbonizing requirements, and their effect on fuel consumption is not always clearly expressed. Believing that this relationship holds the key to further advancement in carbonizing practice, I venture to emphasize them.

Assume a continuous vertical retort at work producing the maximum quantity of gas per ton of coal of the permissible calorific standard, the mean temperature to which the coke has been raised will probably be 1900° Fahr. at most, though the applied temperature may have been 2200° Fahr. Assume the ideal refractory brick were employed of high conductivity, and 2350° Fahr. be applied to the retort, also the speeds of the extractor increased, so that the coke became heated to the same temperature in its traverse through the retort—viz., 1900° Fahr., and the gas yield and the quantity and quality per ton of coal remained the same approximately—the result, of course, is a greater throughput of coal, and thus the apparent cost of the installation is reduced.

The effect on the fuel would also be appreciable. For example, in the assumed case of continuous carbonization, the coal enters cold, the coke leaves cold, the heat put into the coke is given back to the setting, and yet 12 to 13 lbs. of fuel has been consumed per 100 lbs. of coal carbonized. True, some heat passes away in the gas and tar and liquor vapours, and some is utilized in the furnace and chimney; but, without labouring the point, a large percentage of fuel as heat is dissipated into the atmosphere through the outer walls of the setting.

All sorts of non-conductors have been tried to minimize this loss; but since the radiation loss bears a proportion to the size of the setting, it is clear that to increase the throughput of coal is the straightest path to success, whether by means of greater conductivity of the walls of the retort or its equivalent.

To illustrate the point, assume 13 lbs. as the fuel consumption, and it, by the above changes, 25 per cent. more coal could be carbonized, then the fuel consumption would be decreased to (say) 11 lbs. The saving of 2 lbs. of coke represents nearly 3d. per ton of coal carbonized, which would be further economy.

The pyrometer should become a more everyday working tool of the retort-house, if only for the obvious reason that, when judged by the eye, considerable variations of temperature are difficult to determine, and sometimes a range of even 200° Fahr. may be found between the hottest and coldest combustion chamber. With the pyrometer, the heats could regularly be kept within (say) 50° Fahr. Hence, without raising the maximum, the mean temperature is higher with all-round advantage in efficiency.

As has already been stated, the larger the unit the greater the prospect of efficiency—so much so that continuous vertical retorts have already rivalled coke-ovens in point of size, with this great advantage, that with continuous carbonization its daily throughput of between 5 and 6 tons is never handled in bulk; whereas in coke-ovens of equal capacity the machinery and plant must be there to take hold of and handle this bulky charge. Hence coke-ovens must look for adherents to the collieries, and possibly larger gas-works favourably situated for the furnace coke market.

Some South Derbyshire and South Yorkshire coals are known to contain a deleterious percentage of common salt. Gas managers using these coals in their horizontals for many years past have had no great complaint to make as to the short life of their horizontal retorts as compared with other districts, and any disintegrating action noticed may have been attributed to other causes. When these coals, or some of them, are carbonized in coke-ovens, salt has proved a most serious problem. Having experienced trouble from salt in coal carbonized in continuous retorts, I consulted a friend expert in coke-oven practice, who I knew had been grappling with similar difficulties during the last eight years; and the result of his investigation shows that at about 1300° Fahr. the salt is decomposed into sodium and chlorine. The chlorine combines with the ammonia in the gas,

forming ammonium chloride. Ammonium chloride is volatile at high temperature, and entering the hydraulic mains deposits on cooling with the thicker tars, and gives rise to stoppages. Ammonium chloride being insoluble in tar, a free liquor and light tar circulation is in this case necessary to prevent stoppages, as the liquor will dissolve the solid ammonium chloride while the light tar would dissolve any thick semi-pitch which may be formed.

The sodium set free in the retort penetrates the fire-bricks in the oven wall to about the extent of 1 inch, where the brick is at a temperature of about 2012° Fahr., where it combines with the silica, forming sodium silicate. Hollows are formed at these places, while the oven face remains smooth; but about three months after this has taken place the face shells off, leaving a very rough surface.

The higher the percentage of free silica in the retort or oven walls, the more rapid the action. A coal containing one-third of 1 per cent. of salt thus affects unseen the materials of the retort or oven walls. Coals containing five-hundredths of 1 per cent. of salt appear to have no deleterious action.

So serious has this question become in coke-oven practice that recourse has been had to imported refractory material other than silica. This material, called magnesite, has been built in coke-oven walls side by side with fire-clay and has stood beautifully. This material, if well burnt, does not expand, contract, or absorb moisture. It is, however, as yet very expensive. The coke-oven engineers are to be congratulated on their experiments in this direction. It is possible there may be a cheaper way of preventing the destructive action of salt on the refractory material, than by the magnesite walls; but it is seen that there is scope for experiment. From the above it will be clear that it behoves vertical retort contractors to ascertain the percentage of salt, if any, in the coal it is proposed to use, before guaranteeing the life of the settings.

One great object in all industries to-day is to minimize labour requirements—more particularly those of the lower grades. Whether this trend be considered deplorable or the reverse, the outstanding fact remains that present-day industrial conditions are such as to render mechanical aids indispensable to the very life and existence of most industries.

This is equally true from the point of view of the responsible manager, to enable him to conduct his operations at all, in many instances—from the purely economic standpoint, and in the growing tendency to minimize the arduousness of human labour to the utmost.

Although gas manufacturing engineers can scarcely claim to be in the forefront in this particular, there is a notable tendency at the present time on the part of the gas manufacturers generally to avail themselves of the various mechanical aids placed at their disposal; and those of us who have practical acquaintance with the advantages to be derived from the continual modernizing of our own workshop plant and machinery, realize that the tendency is in the right direction and to the eventual benefit of all concerned.

Next in importance to the operations in and about the retort plant is the handling of materials generally, in which the quantity of coal and coke necessarily bulk largely, and have naturally led to the adoption of various mechanical means to relieve and improve upon manual labour. Recent years have seen considerable advance in this direction. The handling of coal presents little difficulty. The bucket elevator and push-plate conveyor still hold their own with the continuous gravity bucket elevator and conveyor. The latter is, however, much cleaner in its operation, as it conveys the material from point to point without disturbance. The handling of coke—particularly in a hot state—is, however, a very different problem, and probably no gas engineer is entirely satisfied with coke-conveyors. This is principally owing to the excessive wear and tear, although of late years some considerable improvements have been made in their construction. Notwithstanding this, the electric telpher is very rapidly displacing coke conveyors. Undoubtedly this type of plant must appeal to the engineers in charge of gas-works, electric power stations, &c. The electric telpher machine can be handled by the average labourer. The upkeep costs are necessarily very low, as the actual telpher machine is the only mechanical moving part subject to wear and tear. The cost of the actual telpher machine only represents about 10 per cent. of the actual cost of an average complete plant. It then follows that the entire handling plant can be duplicated by the engineer installing an additional telpher machine on the track as a stand-by, which can be immediately set to work should any repair be necessary on the first machine. Also the ground space under the elevated track is free for the ordinary traffic, and the telpher track can be carried over buildings, &c., so that a direct line can be taken from the point of loading to the point of discharge. The cost of installing telpherage also compares very favourably with the better types of conveyors; and the tremendous number of these plants that have been installed, and are being installed at the present time in different industries, seems to prove that engineers are rapidly appreciating these obvious advantages, not only for coke but also in conjunction with grabs for coal, and a variety of other materials.

The greatly increasing use of mechanical aids naturally raises the question of motive power. I think most of you will agree that any industry has the right—nay, I would go further and say it is a duty incumbent upon it—to utilize those of Nature's forces which prove most suited to their purpose; and there is no question that the use of electricity in gas-works will greatly extend on this account. It is at the disposal of all, and whether current be obtainable from a public supply or generated by the user, it can with advantage be much more freely used in gas-works than is the case at present. Sentimental objections should, therefore, in my opinion, be firmly put on one side in this matter.

The gas manufacturing engineer, faced with an almost superabundance of mechanical aids and appliances, very naturally and rightly inquires as to the net results of their adoption upon his operations; and he equally naturally looks for some financial betterment before launching out. Generally speaking, his expectations will be realized to a greater or less degree according to the state of his existing plant—as to whether it is of modern or antiquated design. But even in cases that offer little or no pecuniary advantage to his undertaking, he will do well to adopt as many mechanical aids as are practicable; for while his capital charges will of necessity increase, the manipulation of capital is "child's play" compared with the manipulation of manual labour. And given that he only obtains change for the money expended, he is, in my judgment, under present-day labour conditions, fully justified in the expenditure by the comparative security obtained, and incidentally the workers benefit by the less arduous character of the work they are called upon to perform.

It is not my intention to conduct you through the gamut of gas manufacturing operations. My object is to demonstrate the interdependence of the gas manufacturing engineer and the engineering contractor and his fellows. One might, of course, continue a compilation of the various improvements effected by our joint efforts to the end of cheapening the production of the main commodity—gas—and at the same time ameliorating the lot of the worker, in all of which we of this Society may, with all modesty, claim to have played an appreciable part.

It does, of course, sometimes happen that the efforts of some of the industries allied to the gas industry result in disadvantage to other allied industries, as, for instance, the levelling of the output load as between summer and winter by gas cooking, &c., on the one hand, and incandescent lighting on the other, upon the output of gasholder builders. Again, the increased efficiency of purifying plant, due to the adoption of the simple expedient of backward rotation working devised by gas manufacturing engineers themselves, has had the effect for a time, at any rate, of cutting-out purifier orders to a great extent. But these and other such are merely incidents to be taken *en route* of the general progress and as sets-off against other more active spheres.

Reverting to the fact of purifier orders not having been so plentiful of late years, it will be pleasing to the "Heavy Section" to note that the Carpenter epoch-making heat exchange process, which enables a much purer gas to be supplied, will cause more purifiers to be required to take out the additional sulphuretted hydrogen—probably necessitating the doubling in capacity of some purifying plants. In years to come the ideal system of purification may possibly be by way of continuous or semi-continuous methods; the fouled material passing out of the closed box as fresh material passes in.

My first tracing in a drawing office was that of details of an elaborate design of cast-iron gasholder guide-framing. It occurred to me then what a lot of unnecessary money was put into gasholder guide-framing. But my thoughts stopped there; and in time one got accustomed not only to trace but to design similar costly structures. Mr. Gadd evidently had similar thoughts; but, in addition, he gave practical expression to them in inventing the well-known spiral-guided system. This was for a long time looked upon with disfavour, not only by engineers, but also, naturally, by contractors who had not the right to build them. The "spirals," however, commenced to go rapidly ahead as gas engineers got accustomed to their appearance and were able to assure themselves of their stability under all conditions. This undoubtedly caused guide-framed holder builders to design a guide-framing much lighter and cheaper in cost than used to be the case, and of considerably less strength than was previously considered necessary.

Now that the master patent has lapsed, the proportion of spiral-guided gasholders built is far in excess of those column or steel-frame guided which, to my mind, is a case of the "survival of the fittest." I would, however, emphasize one essential—namely, that the details of a spiral holder require the greatest consideration; and care should be taken to have all carriages and the pins of ample proportion, with plenty of safety margin, along with a very rigid and well-secured rail.

Some engineers in the past (and a few still remain) seemed to vie with each other in making and framing clauses in their specifications as difficult as possible of attainment—putting in conditions irksome to the contractor, and generally making him responsible for errors of detail, and omissions in specifications, crowned by the appointment of themselves as sole arbitrators. Such engineers are only human, and have a natural tendency to arbitrate in favour of their own views and work. I would point out that the stiffer a specification is, the more the purchaser has to pay for it—often involving waste of money, and sometimes the rejection of perfectly sound work.

The standard clauses of contract for gas engineering specifications first suggested by our Society, and modelled in conjunction with the Institution of Gas Engineers to the general satisfaction of both, have removed many hardships; and their adoption has undoubtedly put both engineers and contractors on a better basis. It is, therefore, only natural that, having been approved by those

in authority on both sides, they should now be very generally adopted; and, with certain additions suggested by experience in the application of these clauses, this would mark a distinct advance in our relationships one with another and might then be regarded as quite up-to-date.

To keep in the forefront in all departments, and enable contractors to meet all requirements with respect to modern plants, labour-saving appliances, &c., involves a highly-trained, technical staff, capable of working out intricate problems, testing and analyzing materials, and adapting them to changing conditions. The rule-of-thumb method of engineering so prevalent in my early days has now long since died out, and few engineering problems at the present time are insoluble.

I may be justly reminded that there are other aspects of the Society of British Gas Industries than that of the "Heavy Section," in which I cordially agree. To provide the requisite plant and apparatus for producing the gas supply of the country would indeed be a sorry business were it not for the manifold and increasing outlets for the use of this commodity by the public it serves, provided by such branches of activity as are represented by those of our sections facetiously termed the "Light Brigade."

The gas industry is greatly indebted to the inventors and promoters of incandescent lighting, with its more recent developments, the slot meter, cooking, heating, and ventilating apparatus, high-pressure distribution, and the utilization of gas and apparatus now being produced in bewildering variety for the application of gas to all kinds of industrial purposes. Honour to whom honour is due! Let each acknowledge the work and assistance rendered by others, and our Society will become in fact what it is in aim and object, a real community of interests.

At the risk of reiteration, I would venture to say that I know of no greater service open to the gas industry than the reduction of the smoke discharged into the atmosphere and the consequent lessening of the fogs in our towns and cities by means of cheap gaseous fuel. I am convinced that the best interests of this and kindred societies will be served by the most strenuous assistance in this direction that is within our power to render. There is undoubtedly a huge mass of inertia to get under way before success can be achieved; yet there are not wanting signs that the giant is awakening. The reduction of the murkiness of the less frequent fogs in London and our larger towns and cities is evidence of this; and few will dispute the claim that the increasing use of gaseous fuel is the principal factor in the improvement already effected.

In this one direction alone, it is essential that all forces should combine to the end of a lower cost of the production of gas, and the removal of all unnecessary taxes upon it—more particularly the profits which are still appropriated in some instances to the so-called relief of rates.

The suggestion recently made for the formation of a small Central Committee, representative of the various organizations in and around the gas industry is, to my mind, a most hopeful augury; and, though deferred for the time being, it is one that I trust will, in the near future, duly mature, and thereby encourage more than ever a closer approach of all degrees of opinion and interest.

The part played by this Society in the formation of the "B.C.G.A.," and in conjunction with that body and the Institution of Gas Engineers at the National Gas Exhibition last year, is quite sufficient to warrant the expectation of nearer relationship, of greater co-operation.

It is gratifying to know that the membership of our Society is constantly increasing, and now embraces nearly all leading firms in all sections of British gas industries. But we should not rest satisfied till all firms eligible to join our ranks have done so—not from selfish motives, but so that we reap the full advantages of unanimity of objects and joint action for the general good.

Before concluding, I would like to take this opportunity of acknowledging the indebtedness of the Society to those eminent gentlemen who have, so far, favoured us by occupying the presidential chair—more particularly those who have come to us from outside the gas industry proper. The strictly impartial attitudes that they have naturally adopted have in themselves been a binding force among us. To such and all our Presidents, past and present, our hearty thanks are due.

Under these and other auspices, we may now fairly be said to have "got into our stride." As a Society, we pin our faith and reliance upon a combination of science, technique, and commercial sense, as being the best possible for the improvement and betterment of that branch of public service to which we are all attached.

Discussion.

Mr. F. Templer Depree (Exeter) said he could safely say the members had listened to the Chairman's address with the greatest pleasure, because it was an address which gave them all an immense amount of interest. In the first part it dealt, as the Chairman had said, with general subjects; but, in the main, the address was a review of matters which more or less affected the "Heavy Section;" and he had hoped that any discussion there might be would come from representative members of the section. He should, however, like to take the opportunity (and he thought he would be voicing the view of all the members) of thanking the Chairman for his capital address. Several of the subjects with which he had dealt must have been in the minds of many of the members of the "Heavy Section;" but he (Mr. Depree) did not profess to be a sufficiently technical man to combat any of the points the Chairman had put forward, or to criticize them.

Mr. Fred. J. West (Manchester) rose because he thought that the discussion should be "continuous." [Laughter.] He realized that their Chairman had had some difficulty in preparing an address dealing with subjects the discussion of which could only apply to a few of the members. While congratulating Mr. Broadhead on the clear and interesting manner in which he had accomplished his task, he (Mr. West) felt some diffidence in entering into a discussion upon what one might term one's specialities. While differing from the Chairman on several points, he did not feel that this was the proper place for him to enter upon, nor would it be interesting to the members generally if he did enter upon, a criticism of these points. He would simply satisfy himself by saying that he differed from the Chairman when he said that the intermittent system of vertical retorts had a greater range than the continuous system in the quality of coal that could be carbonized. There were also several other points upon which he held opinions contrary to those of Mr. Broadhead—one of them being in regard to the heating of retorts. There was one point in the paper on which he thought that they could all agree, and that was concerning the standard clauses. Following on the remarks of Mr. Marsh, he thought it would be advantageous to the gas industry if the standard clauses of contract were altered so as to specify British manufactured goods. Unless this were done, there would be a temptation to contractors to again introduce foreign materials and sections when they were cheaper than British-made materials. He did not think the choice between home and foreign made materials should be left to the contractors. The time, in his opinion, was opportune when they, as a Society, should approach the Institution of Gas Engineers, and ask them to "take the bull by the horns," and specify in all contracts relating to all departments of the industry that the goods should be of British manufacture. Unless they took this attitude, he (Mr. West) believed there would not be very much difference in the future from what there had been in the past. When the opportunity offered (unless debarred) to buy foreign materials at a few shillings per ton cheaper than British materials, he was afraid some contractors would succumb to the temptation. He therefore suggested that, as a Society, this was a very useful point that they might tackle in the future. They might particularly ask the gas engineers to meet them on this subject, and agree to the necessary clause prescribing British-made material in their specifications. It was only right that nothing but British materials should be quoted for.

Mr. Thomas Marsh (Manchester) spoke of the early fears entertained by all but a few which surrounded the inception of the Society; but that day the members had one of the strongest organizations in the country. They had a Society not intended particularly for personal benefit, but for the general benefit of the industry. If, too, they now had any grievances, they could have a species of arbitration. Those engaged in the gas-stove trade had also experienced the benefit of the Society. They could tell them how at one time they had to expend all the money necessary to get people to use gas-stoves. In those days he believed that those concerned in gas undertakings were the only people who did not advertise their own product. Now in this respect they were working hand in hand. They knew the members of the Society were materially helping them, and they were friendly towards the Society. The Society had, in short, proved a general benefit to the industry. But there was a matter he particularly desired to bring forward. From inquiries he had recently made he had found that almost all the members of the Society had done the patriotic thing. They all had men who had gone to the front; and they were assisting to keep the dependants left behind. The companies in which he was interested were either paying half wages or (in some cases) 10s. per week towards the support of the dependants of men who had gone to the front. Here came a point that he desired, through the Society, to urge upon gas companies and local authorities owning gas-works. There was facing the country a time of serious stress. They all knew the country would come out right; but before then there was going to be a considerable amount of unemployment. It was far better to find employment than it was to give assistance in the way of subscriptions to charity. He should therefore like to urge upon gas companies and local authorities the necessity of not postponing extensions which they had intended to carry out, and which they decidedly must have in the future. They ought certainly as patriots to now go on with these extensions. If they did not do so, they were not doing their duty to the country. He spoke as a Britisher, and said emphatically that, unless gas companies and local authorities did all they could in this way, they were doing something less than their duty as Britishers.

Mr. James W. Wilson (Leeds) wished to say that he thought it was wrong to assume that the address was intended for the "Heavy Section" only. It had been written in such a way that it was interesting to all the sections of the Society; and they were all much indebted to Mr. Broadhead.

The Chairman said he was sorry the discussion had not been greater than it had been. Mr. Depree's remarks were very complimentary, and were much appreciated by him (the Chairman). With regard to Mr. West's observations, he did not expect him to agree with all he said. Of course, what he (the Chairman) had said regarding vertical retorts was mostly based on his own experience. He had found difficulties with certain kinds of coal in connection with continuous carbonization; but he had found no such difficulties in connection with the intermittent system of working. Even with intermittent retorts, the coal charges would likely stick when the life of the retorts was coming to an end; but,

generally speaking, he thought that time would prove the correctness of the remarks made in the address in this particular respect. They were always pleased to hear Mr. Marsh. He was a very eloquent speaker and emphasized his points. Mr. Marsh had been one of those who had helped to made the Society strong and representative. They all agreed with his remarks that gas companies and municipal gas departments should not suspend at the present time work which was necessary for their undertakings, as a good many of them he was sorry to say were doing. One of the principal difficulties was the high price that companies and corporations had to pay for money. At the same time he hoped that a more patriotic spirit would prevail, and that all gas undertakings would use their best efforts (to use a hackneyed phrase) to "keep business going as usual." There was one further point. As the members had heard, they were not likely to have a presidential address from Sir Alfred Keogh at the annual meeting, and so it was hoped that volunteers would come forward with papers for that occasion. They need not be long ones.

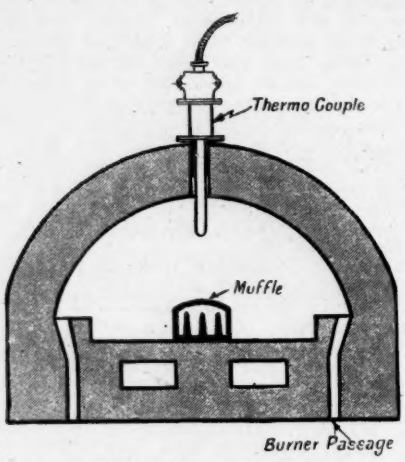
Moved by Mr. W. D. HELPS, and seconded by Mr. CYRIL G. DAVIS, a hearty vote of thanks was passed to the Chairman.

The CHAIRMAN, in the course of his reply, said he must confess that the preparation of the address had entailed a certain amount of trouble, but it had also afforded him a certain amount of pleasure, which had been considerably added to by the manner in which the members had shown their appreciation of it.

On the invitation of the Chairman, the members had tea together. Before separating they cordially thanked Mr. Broadhead for his generous hospitality.

TEST OF A "MANCHESTER" FURNACE.

We give below some particulars of a very drastic test of one of the furnaces constructed by Manchester Furnaces, Limited, of the Globe Works, Manchester. It was carried out last August in the show-room of the Sheffield United Gas Company, in the presence of one of the Company's staff (Mr. Mead) and the Managing-Director of the Manchester Company (Mr. J. Lord).



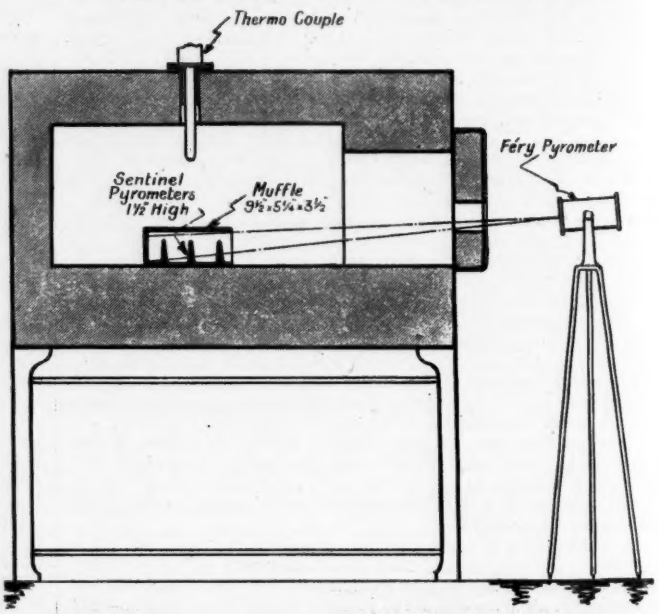
Section through Chamber.

The furnace used was a standard pattern—the "Manchester" type, No. 10 R—the internal dimensions being 3 ft. by 2 ft. by 12 in. high. The burners used were of the blast type; and the general design is shown in the accompanying illustration. The object of the test was to run the furnace at 1000° C., equal to 1832° Fahr. The gas pressure was 20-10ths; the air pressure for the first hour was 48 inches, and afterwards, and on to the finish, 27 inches, or 1 lb. The furnace was in a perfectly green state; a great amount of moisture existing both in the brickwork and the ironwork at the commencement of the test.

The recording instruments used were a galvanometer and thermocouple made by the Cambridge Scientific Instrument Company, and set at zero. Therefore to the figures shown in the table given below must be added the temperature of the cold junction, which, taking ordinary atmospheric conditions, adds 62° C. As this instrument was made to register up to 1100° C. only, it had to be withdrawn at the end of one hour. As will be noticed, the furnace reached this temperature in an hour, starting in a damp condition. As shown in the illustration, the instrument was placed on the top of the furnace, and passed into the heating chamber. Inside the heating chamber was placed a small muffle, 9½ in. by 5¼ in. by 3½ in., inside which the "Sentinel" cones were placed—a very drastic measure of testing the temperature of a furnace, due to the fact that the muffle had to be heated by radiation from the walls of the chamber, and the cones to be heated by radiation from the walls of the muffle. Five cones were employed—800° C., 900° C., 950°, 1030° C., and 1070° C. The 800° cone fell in 27 minutes from starting-up the furnace, the 900° in 34 minutes, the 950° in 41 minutes, and the 1030° in 60 minutes. A Féry pyrometer was placed at the regulated distance from the furnace, and kept in position throughout the test. The focus was set on the back of the muffle.

A test was also made for scale with a long piece of steel, which had undoubtedly been used many times before in the make of furnaces offered by the Gas Company, as it was badly scaled all over. One side was ground perfectly bright. The piece was placed in the heating chamber itself (not in the muffle), and allowed to come up to the temperature of the furnace and soak for a few minutes. Then it was withdrawn, carried a distance of 20 feet in the open air, and dipped in oil. After being cleaned, no scale was perceptible by the naked eye, though it is stated that the piece was afterwards placed under a magnifying glass, when it showed signs of scale at various places.

As previously noted, the test was started with a damp furnace. At the end of one hour there had been used 748 cubic feet of gas, and a temperature had been reached of 1015° C. *plus* 62° C. on the Féry pyrometer, though the thermocouple showed 1100° C. To this must be added also 62° C., the temperature at the cold junction end. At the end of an hour both gas and air were regulated; the air being reduced from 48 to 27 inches water pressure. This regulation affected the temperature somewhat, but at the same time it reduced the gas consumption to 314 cubic feet for the second hour. At the end of each hour further regulation was made of the gas, thereby effecting reduction. At the end of the sixth hour there were being used 218 cubic feet of gas per hour—



Section on Centre Line.

a reduction of 75 per cent. over the first hour—and the temperature was still rising.

The makers claim that these furnaces can be run with 200 cubic feet of gas per hour, using Sheffield gas, maintaining a temperature of 1000° C., or 1832° Fahr., with the furnace empty.

The following are the results of the test:

Time.	Meter Index. Cubic Feet.	Consumption. Cubic Feet.	Temperatures. Féry Pyrometer.	Thermo-Couple.	Sentinel Cone.
10.17	1,429,852	..	..	..	..
10.44	1,430,200	348	870° C.	915° C.	800° C.
10.47	1,430,230	30	880 ,,	930 ,,	..
10.51	1,430,300	70	915 ,,	965 ,,	900 ,,
10.58	1,430,400	100	945 ,,	1020 ,,	950 ,,
11.17	1,430,600	200	1015 ,,	1100 ,,	1030 ,,
11.47	1,430,700	160	950 ,,	..	..
12.17	1,430,914	154	970 ,,	..	..
12.47	1,431,060	146	990 ,,	..	..
1.17	1,431,205	145	1015 ,,	..	..
1.47	1,431,315	110	1005 ,,	..	..
2.17	1,431,425	110	1005 ,,	..	..
2.47	1,431,534	109	1015 ,,	..	..
3.17	1,431,642	108	1020 ,,	..	..
3.47	1,431,751	109	1030 ,,	..	..
4.17	1,431,860	109	1040 ,,	..	..

Gas Consumptions.

First hour—748 cubic feet to get up from cold at 20-10ths gas pressure and 48 inches air pressure.
Second hour—314 cubic feet at 20-10ths gas and 27 inches air pressure.
Third hour—291 ,, ,, ,, ,,
Fourth hour—220 ,, ,, ,, ,,
Fifth hour—217 ,, ,, ,, ,,
Sixth hour—218 ,, ,, ,, ,,

MANCHESTER JUNIOR GAS ASSOCIATION.

Visit to the Widnes Gas-Works.

Between seventy and eighty members of the Manchester Junior Gas Association availed themselves last Saturday of the opportunity of paying a visit to the Widnes Corporation Gas-Works, on the invitation of Mr. Isaac Carr, M.Inst.C.E., the Engineer and Manager. The members were cordially welcomed on arrival by Mr. Carr, Mr. H. H. Mercer (the Chief Assistant Engineer), and many assistants.

Mr. CARR said it afforded him great pleasure, on behalf of the Gas and Water Committee, to welcome them that afternoon. He desired, however, to express the regret of the Mayor of the borough (Mr. David Lewis, J.P.) for his enforced absence. He had been suddenly called away to London on important business; nothing else would have prevented him from being present that day to personally greet them. His Committee were very pleased that the members of the Association had decided to pay a visit to Widnes, and to see what they had to show them. He had not prepared for his visitors a general description of the works, because one had recently appeared in the Technical Press [see "JOURNAL," June 30, p. 1032], and doubtless many had read it. It was a very full and complete description, and some of them would perhaps re-read it after having gone over the works.

About an hour and a quarter was spent in the works, during which time Mr. Carr, Mr. Mercer, and their assistants acted as guides, counsellors, and friends; answering a multitude of questions with the celerity which is born of knowledge and intimate acquaintanceship with a product of which they are proud.

After the visit to the gas-works, the members took tea in the Technical School, by the kind invitation of the Gas and Water Committee. The repast over,

The PRESIDENT (Mr. J. M'Nicholl) said that they had had a most pleasant and interesting afternoon; and the least they could do was to offer their grateful thanks to Mr. Carr for it. They had had an opportunity of seeing for themselves how the cheapest gas in the world was manufactured. Mr. Carr and his assistants had that afternoon showed not the slightest disposition to hold anything back; so that they ought all to be wiser than before they came to see the "wonders" of Widnes. He desired, also, through Mr. Carr, to thank the Widnes Gas and Water Committee for their kindness in providing for their creature comforts. He was sure that they had all been impressed with the smoothness with which everything worked, and the apparently small number of men engaged; also the small amount of labour involved in the working of the plant. Personally, he had never been in a house (whether horizontals or inclined) that seemed to be so free from the noise and bustle usually associated with retort-houses. They had had the privilege of viewing what was practically the "last word" in horizontal retorts; and he learned that the plant had come up to Mr. Carr's expectations. Anything that came up to Mr. Carr's expectations was certainly beyond praise. ["Hear, hear."]

Mr. W. BUCKLEY (Manchester) said he had great pleasure in seconding. The members of the Junior Association who were present that day would, when they became managers, always remember their visit to the Widnes Gas-Works, and regard it as the standard to apply to for the best results. When they knew that Mr. Carr had reduced his capital charges 70 per cent., and the price of gas 77 per cent., they would realize that it was something of which to be proud. There were many points about the working of the retort-house which would no doubt be useful to the visitors. Those who went on to the top of the house would notice how wonderfully cool it was. He did not think he had ever before been on one so cool.

Mr. CARR, in replying, said it would give him the greatest possible pleasure to convey their thanks to his Committee. He hoped they would have a profitable discussion on the paper which was to be read by Mr. Neill, on "Woodall-Duckham Vertical Retorts at Bolton."

WOODALL-DUCKHAM VERTICAL RETORTS AT BOLTON.

Mr. NEILL then read a paper on the above subject, which, along with some of the observations thereon, will be found on p. 302. The value of the paper was greatly enhanced by a number of lantern slides (57 in all), which were prepared by Mr. Neill from his own photographs; the lantern being operated by Mr. F. C. Hudson, F.R.S., of the Widnes Municipal Technical School.

VOTES OF THANKS.

At the conclusion of the reading of the paper,

Mr. A. BARRETT (Ramsbottom) observed that while there might be a difference of opinion as to the best system of carbonizing, they all agreed that Mr. Neill had gone to a great deal of trouble to give them so excellent a paper. The least they could do was to accord him a hearty vote of thanks for his efforts.

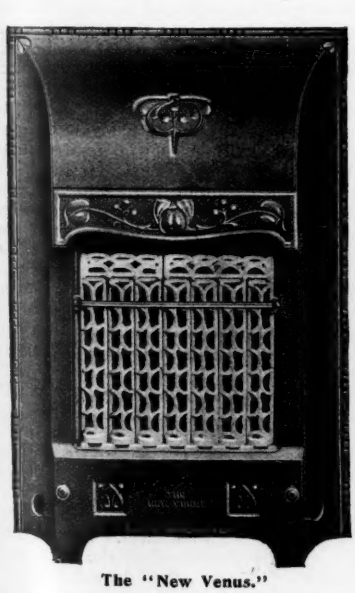
Mr. BATTERSBY seconded, and Mr. NEILL briefly responded.

This concluded the proceedings.

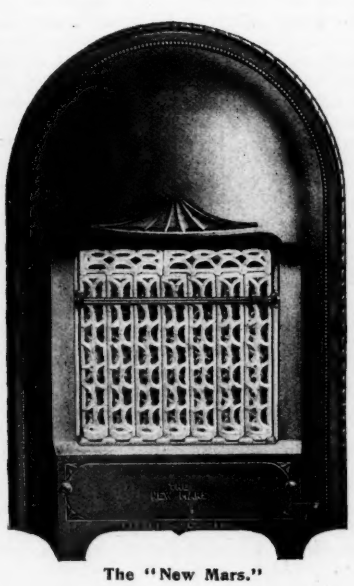
THE NEW PLANET FIRES.

SOME particulars were given in the issue of the "JOURNAL" for the 27th ult. [p. 184] of a new series of fires introduced by the Planet Foundry Company, Limited, of Guide Bridge; and these are now supplemented by illustrations of the three patterns comprised in the series, each of which is stocked in three sizes. They are the "New Venus," the "New Mars," and the "New Saturn"—the last-named a nursery or bed-room fire, with a flat top to accommodate a boiling-ring.

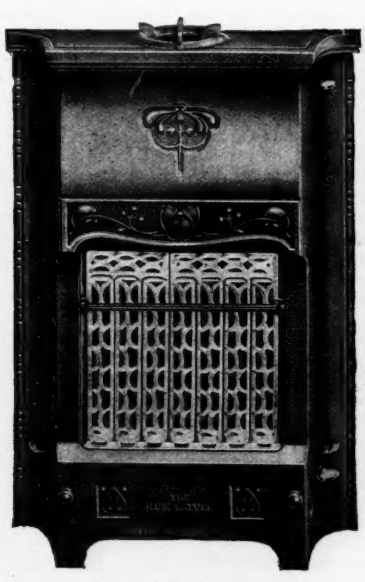
A feature of all the Planet gas-fires is the special gas and air adjuster with which they are fitted. This, as previously pointed out, enables the proportions of gas and air to be so minutely controlled that the burners are noiseless in action, while perfect combustion is secured. The principle on which the adjuster works is one of breaking-up the gas into small parallel streams, which is effected by means of a screw-controlled plug, around the periphery of which are cut a series of graduated grooves. These working in a sleeve having an internal collar of definite length, enable the orifices from which the gas issues to be enlarged or reduced as the plug is moved backwards or forwards, to suit the varying pressures and qualities of gas supplied. The gas consumption can thus be easily regulated to the desired point; it is merely a matter of adjustment. This fact is emphasized by the "Lancet" in a paragraph showing that the consumption of gas in the stoves can be regulated as desired.



The "New Venus."



The "New Mars."



The "New Saturn."

We have received from Messrs. Emmott and Co., Limited, of Manchester and London, the "Mechanical World" Pocket Diary and Year Book for 1915. This is the twenty-eighth issue, and it contains a collection of useful engineering notes, rules, tables, and data. The section on the "Gas-Engine" has been extended, and many new features have been introduced in the book, the text of which has been thoroughly revised, and brought up to date. The price is 6d. net.

WOODALL-DUCKHAM VERTICAL RETORTS AT BOLTON.

By Robert Neill, of Bolton.

[A Paper read before the Manchester and District Junior Gas Association, Nov. 7.]

The Bolton Corporation have two separate gas-works—the Lum Street works, with a capacity of four million cubic feet per day, and the Gas Street works, with a capacity of two millions. It is at the larger station that we have installed Woodall-Duckham vertical retorts.

Prior to the installation of vertical retorts, the retort-house contained four benches of horizontal settings, in two rows, built lengthways of the house. Each bench contained nine settings of eight Ω-shaped retorts, 21 in. by 15 in. by 20 feet long. To make room for the vertical retorts, five settings of horizontals were taken down from each of two benches—giving a floor-space 50 feet by 136 feet. This space not being quite sufficient, part of one side wall of the house was taken down and rebuilt further out, so as to give a space 50 feet by 150 feet. In this space it was possible to erect nine settings of Woodall-Duckham vertical retorts having a capacity of 180 tons of coal per day or 5 tons per retort per day.

As most of you are no doubt aware, in the Woodall-Duckham system the brickwork is not built direct on the foundations, but is supported on a floor of steel joists, which in turn is supported on built-up stanchions. It will, therefore, be seen that the load is not evenly distributed over the whole surface of the foundation, but is concentrated at the points on which the stanchions rest. And as the total weight of the bench is 3592 tons, or 94 tons on each stanchion, it is necessary to give much greater attention to the putting down of the foundations than is the case with horizontals. The thickness of concrete varies at different parts of the house. At four places we had to fill up existing subways 8 ft. 6 in. deep. The minimum thickness is 4 feet; and here it is reinforced with old lattice-girders and joist buckstays.

The stanchions are composed of two 12 in. by 5 in. rolled steel joists, strongly plated, and filled in with concrete, giving a factor of safety of 5½. They are spaced at 7 ft. 6 in. centres down each side of the bench; and along the top of each row there are two 15 in. by 5 in. rolled steel joists running the full length of the bench. Across these latter are the 15 in. by 6 in. rolled steel joists which form the floor on which the setting is built. This floor is at a height of 16 ft. 3 in. above the floor-level.

Each setting consists of four rectangular retorts, each 25 feet long, 3 ft. 10½ in. by 7 in. at top, tapering to 5 ft. 3 in. by 1 ft. 6½ in. at the bottom. The taper is mostly in the top 10 feet, as it is there that the most rapid swelling of the coal takes place, and so there is more liability to hold-up. The top 6 feet of each retort is built of Silica bricks, 4½ inches thick; the remainder, except for a small portion at the bottom, is built of specially panelled-out Stourbridge bricks. They are very strong, yet at the same time they easily conduct the heat to the charge in the retort. All the bricks are tongued and grooved, giving very strong and tight joints.

The producer is placed between the two retorts at the front of the setting; the height of the ash pan from the bottom of the setting being 8 ft. 7 in. or 24 ft. 10 in. above the floor-level. Slightly higher than the ash pan, at a height of 26 ft. 3 in., is the clinkering stage, which runs the full length of the bench, and is 15 feet wide. It is composed of ⅜-inch chequered steel plates, supported from the buckstays on the bench side, and on lattice steel columns on the opposite side. There is a shoot in the centre of the stage, down which the clinker is tipped into iron barrows on the floor level. The producers are 3 ft. 6 in. wide by 6 ft. 3 in. back to front by 6 ft. high from the firebars. They have three gas outlets at the top; the centre one being 13 in. by 9¼ in., and the two outside ones 6½ in. by 9¼ in. The gas passing out by the centre one heats the two back retorts; that passing out of the two side ones heats the two front retorts. The grate area is approximately 22 square feet.

Primary air is admitted through two openings, each 13 in. wide by 6 in. deep, at the back of the producer; and each has a cast-iron hood to prevent the air short-circuiting up the back of the furnace. Water is kept in the ash-pans at a constant level by means of an overflow, regulated by a small tank (with a ball-tap) situated at the end of the bench. By raising or lowering the tank, the whole of the overflows are raised or lowered together. By means of this water, sufficient steam is provided to keep the clinker fairly soft; so that clinkering has only to be carried out every 72 hours.

The primary air enters at both sides of the setting, and passes along the outside of each retort; then through tubes placed between the retorts; and back to the front of the setting, where it passes up an uptake, and back to the centre of the setting immediately below the ash pan. Here it enters the back of the producer, as before described.

The secondary air is admitted at the back of the bench, and takes a zig-zag course up through the regenerator, which is built between the two back retorts and immediately behind the producer itself, where it meets the producer gas at each side of each retort.

On leaving the combustion chambers, which are on each side of each retort about 2 ft. 6 in. from the top, the waste gases travel to the bottom of each side of each retort, and here there are check tiles to control them. After passing the check tiles, the gases travel by means of uptakes situated between the retorts back to the top of the setting, when they enter the regenerator and pass downwards to the outlet to the main flues. The waste gases can be checked separately at each side of each retort, or collectively just before they enter the main flue. The producer gas can also be checked at each side of each retort—thus ensuring an equal distribution.

The main flue is carried on a concrete floor, supported on joists which rest on the floor of the setting and on the wall of the house. It is divided into two parts—one having five settings to it and the other four. Where they enter the chimney, there are two main dampers, with automatic air regulators, which keep a constant pull on the settings. The chimney is 140 feet high, and has an area of 20 square feet inside. To ensure that the draught from one flue does not affect the other, a midfeather is carried up the chimney for about 35 feet above the flue inlets.

Each setting is absolutely separate from the next one to it; a straight joint 1 inch wide being left between them. This joint is filled with compressible non-conducting fire-resisting material, so that expansion is taken up and provision made for each setting to be let down or cooled-off without in any way affecting the working of the adjacent setting. Each retort is divided at the top by a 4½-inch wall, so that there is a space for the entrance of coal, and one for the outlet of the gas. On one side of the division wall, there is a sliding plate to control the amount of heated space through which the gas has to pass on leaving the retort.

The gas on leaving the retort passes through a rotary valve, which forms part of the arch-pipe itself, and is so arranged that it is easily accessible for cleaning without dismantling. This valve is used for shutting-off a single retort for the purpose of scurfing, or for any other reason, when it is not desired to isolate the whole bed of retorts.

The gas then passes through a seal-pot or hydraulic main, which is provided with a series of baffles for the purpose of removing the heavier tar and particles of coal dust which may be carried over from the retorts.

One hydraulic main is common to the four retorts of one bed. The tar overflow is so arranged that the tar is always taken from the bottom. In this way as much as possible of the heavy tar flows away first. There is a large cover on each seal-pot, which can be removed when the plant is working. Pitchy deposits, &c., can thus be easily cleaned out daily. The level of the overflow is adjustable, so that the seal can be altered as desired.

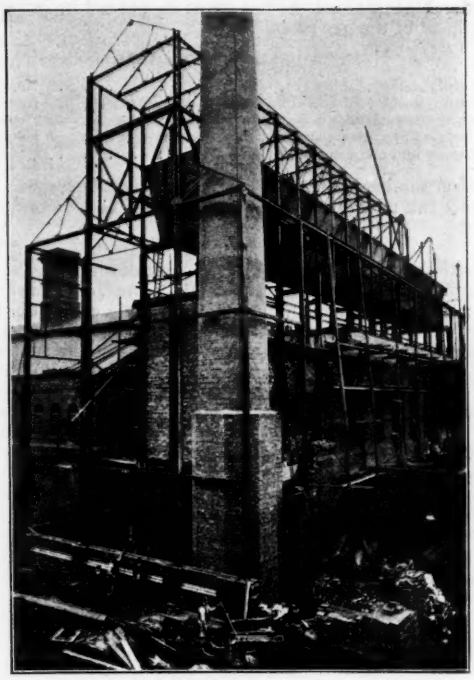
On leaving the seal-pot the gas passes up through a 12-inch pipe (almost vertical) to the foul-main which is situated along the top of the overhead coal bunkers. The foul-main is a 20-inch one, 24 inches in diameter; and each branch has a valve, so that any setting can be isolated.

The liquor supply pipe to the seal-pots runs over the foul-main, and is fed into it at each setting through a tight feed-seal; the liquor running down the 12-inch uptakes into the seal-pots.

The foul-main drops down to clinker stage-level at the end of the bench, where there are two 12-inch Parkinson and Cowan governors, complete with inlet, outlet, and bye-pass valves.

On the top casting of each retort a small steel coal-feed hopper is fixed, which holds about 8½ cwt. of coal. The coal is fed into this hopper every two hours from the overhead bunkers through a rotary coal-valve. The speed of travel into the retort is regulated by the speed of the coke-extractors working at the bottom. These coke extractors work horizontally at the bottom of each retort, and feed the coke into a receiving chamber, which has a capacity of about three-hours make. It is, however, emptied every two hours. The extractor is formed of a series of four-armed castings, fixed on a square shaft in such a manner as to form a double spiral. On the outside of the extractor-box is a wheel with a V-shaped groove in the rim, into which fits a wedge-piece attached to a rocking arm, so that when the arm moves backwards the wedge-piece is loose, but when the arm goes forward the wedge-piece tightens and slightly turns the extractor. These rocking arms are attached at the opposite end to reciprocating bars, which travel the full length of the setting; and at each point of attachment there is a cast-iron safety bolt which breaks should the extractor from any cause stick. The reciprocating bars are worked by two eccentrics at the end of the bench, which are driven through worm-gearing by either of two 6-H.P. gas-engines. The actual power required, however, is about 2H.P. The engines make 290 revolutions per minute; the eccentrics one revolution per minute, and the extractors one revolution in from 55 to 65 minutes. This latter speed can be separately regulated at the eccentrics, or at each retort rocking-arm, so as to suit the class of coal being used, the candle power required, &c.

Immediately below the receiving chamber is a revolving door, which seals-off the retort by means of a water-seal. This door is operated by a hand-wheel every two hours, when the coke produced passes out into a travelling hopper, which delivers it on to a tray-conveyor working in a trench below the floor-level. This conveyor has a capacity of 30 tons of coke per hour; so that the whole bench can be discharged very expeditiously. The quantity of coke discharged from each retort is about 6 cwt. every two hours, or about 10 tons 16 cwt. for the whole bench every discharge. At the end of the setting, the conveyor rises at an angle of 30°, and delivers the coke into a hopper (having a capacity of



The Bolton Retort-House under Construction.

about 20 tons) provided with automatic doors operated by the weight of the telpher skips, and closed again when the skip has a load of 1 ton—the whole operation being carried out by the telpher driver. The conveyor is driven by an 8 H.P. electric motor with belt drive.

Should the conveyor break down, trucks can be placed under each retort, and the coke wheeled out by hand. The coke for the producers is fed into hopper-bogies, which run on rails beneath the retorts, and is carried up to the storage bunkers by the same gravity bucket elevator which carries up the coal.

Coal is brought into the works by overhead railway and by carts. The latter is tipped direct into a feed-hopper over the coal breaker pit, while the former is first tipped into an overhead hopper by means of two hydraulic rams and gravitates through an operated door at the bottom into the hopper used by the carts. From here it is fed by means of a tray-feed into a coal-breaker capable of dealing with 45 tons per hour. The small coal does not pass through the breaker, but is bye-passed through the tray-feed into the shoot below the breaker, where it is fed into a gravity bucket elevator capable of dealing with 50 tons of coal per hour. It is then carried vertically a height of about 85 feet, and horizontally along the full length of the setting—being dumped into the bunkers at any desired point by a travelling shoot and tippler. The gravity bucket elevator is driven by a 15 H.P. electric motor, and the breaker by a 20 H.P. electric motor.

Should the breaker or elevator break-down, an electric hoist is provided for taking up coal and coke to the bunkers overhead. The hopper waggons before mentioned are used for either coal or coke, and will carry 1 ton of the former. The lift will carry a load of 1 ton at a speed of 90 feet per minute to the top of the bunkers, which have a set of rails running the full length, so that the coal or coke can be emptied as desired. The lift is worked by a 10 H.P. motor, controlled by the man travelling in the cage; there being safety gates at each landing which, when open, lock the operating rope so that the cage cannot be moved.

The coal and coke bunkers are carried by cross joists attached to the tops of the bench buckstays, and are capable of holding 48-hours' supply of coal. By having bunkers of this capacity, we are able to stop operating the coaling plant from noon on Saturday until Monday morning. The coal-valves through which the retorts are fed are situated immediately below the bunkers. The coke is fed into the producers through a long permanent shoot with an operating door at the lower end, and into the retorts at starting-up by a movable shoot which is carried from one retort to another as required—there being doors in the bottom plates of the coke bunkers to which it is attached.

The existing retort-house had, of course, to be altered to suit the verticals; and the latter being fixed across the old house, the existing gable became the side of the new building. To accomplish this, two bays of the roof were taken down and the gable brickwork levelled-off. Steel stanchions were then placed on the old walls, and panelled in with 9-inch brickwork to the required height.

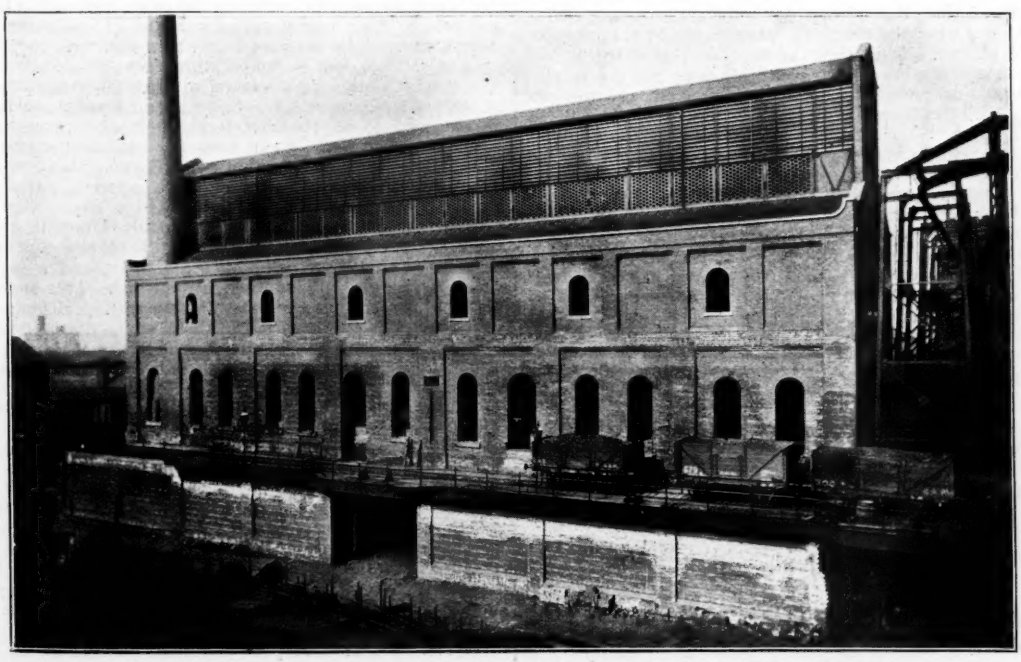
On the side next the remaining part of the old house, a stee framework was built on top of an existing principal, and sheeted over with corrugated asbestos sheeting. The whole of the raised part of the building is built to match the old portions, so that there does not appear to have been an alteration. The roof is in three portions—there being a small span roof over the coal bunkers and a lean-to roof lower down on either side. Each lean-to roof is glazed the full length, by about 4 feet deep, so that there is ample light on the setting.

Drying the Settings.

The time required to dry the new settings was from six to eight weeks; and the usual practice applicable to other regenerative settings was followed. For the first two weeks, the fire should not be more than 18 inches deep, and liberally supplied with air, to ensure complete direct combustion and thus avoid the passage of any producer gas into the setting. All dampers and sight-holes should be open to allow all steam to get away quickly. After about three weeks' drying, steam should cease to issue from sight-holes and dampers. The chimney draught is then brought into action by closing all the sight-holes and the damper doors, but leaving the dampers open. The pull at this period should be about 4-10ths. If this pull cannot be obtained, a fire should be lit in the main flue, and kept alight till it is found that the desired pull is obtained.

The setting being now closed-up, the chimney pull should soon increase sufficiently to ensure a pull at all points of the setting; and it is most important that this pull should be maintained to avoid the risk of explosions in the flues through the accumulation of gases. When the pull is maintained, the secondary air inlet should be slightly opened, so as to give a current of air to carry away any steam, &c.

For the first five weeks all fuel is added through the clinkering door; but by the end of this time the fire should be well to the front, and piled as high as convenient. The drip-plates are now



NEW BUILDING AT BOLTON FOR THE WOODALL-DUCKHAM VERTICAL RETORTS.

put into position in front of the producer, and the setting is ready for changing over to gaseous firing preparatory to getting up the working heats.

Raising the Heats.

Coke is now fed into the producers through the top charging doors, so that the fuel is brought up to within about 9 inches of the CO take-offs. The primary air is admitted and regulated at this point through slides in the clinkering doors, and not through the setting. The CO produced is burnt to CO_2 in the crown of the producer before entering the setting—secondary air being admitted for this purpose through a hole in the brickwork over the clinkering door until the colour of the crown reaches a bright red or dull orange. This occupies about three days; and by this time the distributing flues round the top of the retorts, and also the top part of the retorts should be a good red colour. At this point the hole in the producer front is bricked-up, and secondary air is admitted through the regenerators—the bricked-up producer being gradually filled up to the cover plate.

Having seen that the gases are burning properly in the combustion chambers, attention is paid to the various dampers, which are regulated and adjusted until the working heats are attained. The retorts at the top should be a bright red and at the bottom a dull red. The settings are then ready for gas making.

Gas Making.

The retorts are filled with coke up to the underside of the top casting; the extractors being kept moving during filling, so as to prevent dense packing and consequent holding-up. When the charge is heated through, the top cover of the retorts is fixed in position, and coal is admitted through the rotary valve. In a few seconds gas begins to show at the rodding-holes. Then the retort-valve is opened, and gas making proper is commenced.

The amount of coal entering the retort being regulated by the amount of coke discharged, it is advisable until the new coke appears at the extractors to take small quantities of coke from the bottom at intervals, in order to ensure the bottom chamber against emptiness with the possibility of loose coke rushing over the extractors and so causing a big feed of coal with consequent holding-up later on. It is usual, until the new coke appears, to work the extractors very slowly, or to stop them occasionally for about fifteen or twenty minutes. This reduction of speed is necessary because the filled coke is much looser than the made coke, and is liable to overrun the extractors, with consequent excessive feeds of coal.

After twelve or sixteen hours of the above working, the newly-made coke will appear, and the bottom castings may be emptied, since the made-coke charges hold themselves up—only the desired amount passing the extractors according to the adjusted speed.

Retorts must never be opened at the top for charging, nor must a man be rodding a retort when the coke is being discharged at the bottom. To ensure against this, it is wise to charge at even hours and discharge at odd hours, or *vice versâ*. Nor must a coal-valve be opened when the bunkers are empty, or ever left open; and the discharging door should be closed as speedily as possible after discharge. The reasons for the above precautions are, I think, fairly obvious.

Clinkering.

At first this was done every 24 hours; but the period has been gradually extended as the men got more used to the working of the plant, until now we clinker each furnace every 72 hours. It is an advantage to prick-up the fires three or four times per shift.

Scurfing.

The length of time that retorts work without scurfing varies from six to ten weeks; the necessity being shown by the irregular travel of the charge. To do this, the retort is shut-down as follows: The charge is allowed to travel down until the top is just below the brickwork, when the extractor is stopped, and the gas pulled away until the charge is practically burnt off. The valve on the arch pipe is then closed, and the cap on the pipe immediately over the retort removed. The extractor is then put into action again, and the heats checked at the check-tiles at each side of the retort. The extractor is then speeded-up or the charge helped out by an occasional turn of the extractor by hand.

When the retort is empty, the top plate is taken off, and a plug taken out of the bottom rodding-holes. The current of air passing up the retort soon causes most of the carbon to fall away—only a small portion at the top having to be removed by bars after the retort has been open about forty hours. The major portion of the scurf forms in the top 6 or 8 feet of the retort, particularly at the corners. A retort is usually out of action about 48 hours for scurfing.

Temperatures, Draughts, &c.

At the point of combustion, the temperature is about	2350° Fahr.
At the bottom of the retort, " " "	2000° "
Scurfing temperature at the combustion chambers is about	1750° "
Pull at the outlet from the governors	22-10ths
" " top of the retorts	*Nil*
" " bottom of the retorts	1½ "
" " entrance to the chimney	9 "
" " main dampers	6 "
" " bottom of the heating flues	3½ "
" " top " " "	2 "
" " underside of the firebars	1¼ "

From the above, it will be seen that unless the pull on the retorts is considerably increased, the flue gases should not be drawn in to the detriment of the gas proper.

Number of Men and Duties.

Attending to the coal breaker, &c.	1 man*
Attending to the coal and coke bunkers and elevator	1 man*
Charging the retorts and seeing to any hold-ups, &c.	2 men
Discharging the retorts and attending to extractor gear	1 man
Clinkering and charging the furnaces	1 man

The above number of men is per shift of eight hours, except in the case of two men (marked *), who are daytime men only.

Sunday Closing-Down.

We will suppose it is required to shut-down from 10 p.m. on Saturday until 10 p.m. on Sunday. The procedure is as follows: About 6 p.m. on Saturday, we slightly check the heats and work on as usual until about 9 p.m., when the dampers are put to scurfing positions. At 10 p.m. the extractors are stopped, leaving the coal-feed hoppers about half-full. We continue to pull off gas until the candle power is at a minimum, when the main valve is shut and the blow-off valve opened. Everything is now at a standstill until 10 p.m. on Sunday. The producers should be charged during the stoppage at about six-hour intervals. The reason for checking the heats so early is to get a long tail of coal down the retorts, and thus prevent shrinkage of the charge when standing. This prevents the blistering of the carbon which would probably cause a hold-up when re-starting. At 10 p.m. on Sunday we start the extractors and see that all the charges are moving. As soon as good gas appears at the rodding-holes, we close the blow-off valve, open the main valve, and start the exhausters. The heats are then gradually brought forward to the original temperature, and the plant worked as usual.

Advantages Claimed.

1. Great economy in labour charges.
2. Small ground-space required.
3. Absence of smoke, steam, and dirt in the retort-house.
4. Each piece of coal undergoes exactly the same treatment.
5. Better and more even quality of coke.
6. Candle power of gas can be varied at will.
7. No waste heat from red-hot coke, open retorts, &c.
8. No stopped pipes.

DISCUSSION.

The President (Mr. J. M'Nicholl, of Warrington) said the paper gave members ample scope for discussion, and he hoped they would avail themselves of it.

Mr. W. H. Buckley (Manchester) said he was sorry Mr. Neill had not given more figures, such as the weight per ton, candle power, sulphur content, and so on. One point he mentioned was that on no account should a man be rodding a retort when the coke was being discharged, or he would get hurt. Another was that the bottom discharging-door should not be opened, or, if it had to be opened, that it should be with as little frequency as possible, or there would be a reduction in the candle power. The author stated that there was 1½-10ths of back-pressure at the bottom of the retorts, therefore at the same time he could not draw in air. There was only one thing in the paper which he could not quite understand. Mr. Neill said that at Bolton they at first clinkered every 24 hours; but the period had been gradually extended as the men became more used to the working of the plant, until they now clinkered each furnace once every three days. This seemed to him (the speaker) to be a very long time. An American engineer came one day to see the plant at Droylsden, and among other points raised was that of clinkering; and the American candidly confessed that he never clinkered. With regard to the question of temperatures, draughts, &c., it seemed to him that at Bolton they worked at fairly high temperatures, for at the point of combustion—he was using Centigrade, being more accustomed to do so than Fahrenheit—the temperature was, roughly, 1300° C., and about 1000° C. at the bottom of the retort. The figures given by the author were very much lower for scurfing. He (the speaker) would certainly have expected that when scurfing they would get the retort hotter than when carbonizing.

Mr. Neill, in reply, said it was really a fact that they only clinkered every 72 hours. One reason for this was that they had a plentiful supply of water in the ashpan, and a considerable quantity of it was undoubtedly evaporated. This steam passing through the bottom kept the clinkers soft. Pricking was done every three or four hours, and there was a special workman to see to it. It was "not a five minutes' job." With regard to Mr. Buckley's comment on the scurfing temperature, the temperatures stated were as they worked out at Bolton. If the dampers were not checked, the temperature of the retort rose to such an extent that excessive heating took place.

Mr. J. T. Haynes (Liverpool) said it occured to him that the gas had to travel a long way before leaving the retort. With regard to scurfing, he did not quite see the necessity for dropping the temperature of the retort. He would like to ask the author whether, after shutting-down for the week-end, he found any trouble with coal holding-up in the retort, as, in vertical retorts, if they only held-up for a few hours there was considerable trouble in getting the coal on the move again. The flue arrangement in the setting appeared to him to be an extremely complicated one, and not to be readily got at for cleaning purposes.

Mr. A. Taylor (Stockport) asked the author how he measured

the temperatures he quoted. He noticed that in one instance Mr. Neill went as high as 2350° Fahr.

A VISITOR said he agreed with the remark with which the author prefaced his paper—that his contribution was chiefly descriptive and not argumentative. With regard to the number of men employed to work the settings, Mr. Neill said he had one man attending to the coal-breaker, &c., one to the coal and coal-bunkers and elevator, two men on charging the retorts and seeing to any hold-ups, one man clinkering and charging the furnaces, and one discharging the retorts and attending to the extractor gear, "and one extra man," he added, "for odd jobs." This gave him a total of seven, as against six shown in the paper. Were all these shift men? How many men would it take every 24 hours to work the whole plant? Would the author also give the members some information about the seal-pots? He (the speaker) heard a paper read in connection with seal-pots, and, if he remembered rightly, the author of it had had some troubles in connection with them. He noticed that water was used in the arch-pipes and the extractors. Was any further use made of this water, or was it all run to waste? He noticed, too, from the photographs thrown on the screen, that the building of the retorts at Bolton progressed on very even levels. This struck him as being a very good idea in construction; and probably it was done with the object of keeping an evenly distributed load on the bottom stanchions.

Mr. W. LAYCOCK (Hebden Bridge) asked the author whether he found that poking was necessary; also whether coke had to be used when starting again after shutting-down at week-ends.

Mr. W. H. BATTERSBY (Bury) inquired whether the retorts would successfully carbonize slack. He said he noticed recently in the Technical Press some remarks made by the Chairman of the Southport Gas Committee, in which he said that, so far as he knew, slack had never been tried in vertical retorts. [See *ante*, p. 146.]

The HON. SECRETARY read the following communication from one of the members, Mr. W. Bennett, formerly of Stalybridge, but now at the Greenock Gas-Works:—

I congratulate Mr. Neill on the production of a very able paper and accurate description of the Woodall-Duckham vertical retorts. Mr. Neill makes no mention of it, but in our plant we have an indicator consisting of a conical weight resting on the surface of the coal in the coal-feed hopper, and connected to a chain passing over a pulley. As the coal is fed into the retort, the weight falls and pulls up the chain, from the position of which we are always able to tell at a glance when a charge is holding-up.

One point which is well brought out is the great saving in floor space as compared with horizontals.

By placing the automatic regulators in the main flues, a constant pull is obtained in these flues; but it by no means follows that the quantity of air drawn through the air-slides is uniform. The condition of the flues, the nature of the fuel, and the time elapsed since clinkering, are all varying factors which the regulators fixed in the main flues do not control, or, at any rate, only to a very limited extent. A much more efficient method is to place automatic regulators (such as Brooks's) on the air-inlets.

I shall be glad to know at what depth Mr. Neill works his sliding plate in the retort, and if he has made observations as to the effect of increasing or decreasing the heating space—on the quantity and quality of the gas, and the production of naphthalene.

I assume that the list of the number of men and duties applies to the case when all the beds are working. What reduction takes place when only four settings are at work? Is there any difficulty at Bolton in using the same class of coal as with the horizontals, and what are the comparative results by the two systems?

ANOTHER MEMBER was about to address a question to Mr. Neill, when

The PRESIDENT said he much regretted to have to disallow it, as there was very little time left to wind-up the proceedings. He desired, however, to congratulate Mr. Neill on his exhaustive and interesting paper; the scope of it was really remarkable. He also wished to congratulate the author upon the splendid slides which he had exhibited, and which he (the President) understood had all been made from Mr. Neill's own photographs, and by himself. What struck him about the vertical retort system was that it enabled one to have more control of heats, and almost every flue was "get-at-able." This was certainly a great point in their favour. They could also have a greater depth of fuel in the generator—a further advantage. The question of floor space, too, was another feature. He observed that Mr. Neill used electric motors for driving the coal breakers and elevators. He would have preferred using a steam-engine, as being the better practice. With regard to the question of clinkering, he thought Mr. Buckley's American friend was on the right track. Clinkering ought to be unnecessary. In household fires there was no need for clinkering—people simply poked out the ash or clinker in the simplest possible way; and it should be the same in gas-producers. With regard to the temperature of scurfing, he thought there was a little misunderstanding about this question. Mr. Neill mentioned the temperature of the combustion chamber; but no doubt that of the retort was higher. He (the President) should contend that it would be higher when scurfing, though lower in the combustion chamber.

REPLIES TO QUESTIONS.

Mr. NEILL, speaking generally in answer to the various questions and also to others which arose out of some conversational discussion, said that in reference to the question of the use of automatic air-regulators he might say that their chimney pull was not known to vary very much. In regard to the sliding plate mentioned by Mr. Bennett, it had never been altered since it had been installed. As to the question about the varying classes of coal and the using of slack in vertical retorts, it was an admitted fact that more nuts could be carbonized by vertical retorts per day than when slack was used. He thought that the comparison worked out at 20 tons of nuts per day, as against 16 or 17 tons of slack. There was this feature also to be remembered—slack tended very much to hold-up. With regard to floor space per 1000 cubic feet (interior of retort-house), the figures at Bolton were: 3 feet with vertical retorts, 6·4 feet with hand charging, and 5·3 feet with power stoking machinery. The pitchy deposits which had been spoken of were peculiar to a special setting. In answer to Mr. Taylor's question respecting the measuring of high temperatures, his practice had been to use Watkins's heat recorders; and for the more accurate readings he used a Féry radiation pyrometer. With respect to the query raised by Mr. Laycock and others, it was not necessary to use coke for starting-up after week-ends. He was glad to hear read the letter from Mr. Bennett. Referring to one of his questions, he said that at Bolton they used an indicator in the same way as at Greenock, and could tell by a glance if the charge was holding-up. As to the water used in the arch-pipes and extractor, this at present was run to waste; but it would soon be made further use of. With reference to the number of men employed per day, they had 16, not including the foreman. These men carbonized 180 tons per day, as against 23 men when stoking machinery was used. Answering another question, Mr. Neill, in conclusion, remarked upon the necessity for insisting upon evenness and steady progress of walls during erection. This, he said, had been done at Bolton, so as to give an evenly distributed load on the stanchions, and also to keep the brickwork in good bond.

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

Opening Meeting of the Session.

The Opening Meeting of the Session of the Scottish Junior Gas Association (Western District) was held in the Royal Technical College, Glasgow, last Saturday—Mr. JOHN WILSON presiding at the outset of the proceedings.

Mr. WILSON said the period of his office had been particularly pleasant. The Council had supported him in every way possible and his dealings with them had been most harmonious. He thanked the Association for the honour they had done him. It should have been his duty to say a few words to introduce the new President. Unfortunately he was unable to do so, as Mr. Thomas Carmichael, who had been elected their new President, had been promoted to a position in England. He therefore called upon Mr. David Fulton, of Helensburgh, their Vice-President and acting President, to take the chair and conduct the meeting.

Mr. FULTON, on taking the chair, moved a vote of thanks to the retiring President, who, he said, had done remarkably well during the session. He was very glad to see such a good gathering. It was hardly to be expected that they would have a large attendance in view of present circumstances. Mr. Carmichael, who had been appointed to the position of Manager of the Eastcroft Gas-Works, Nottingham, had tendered his resignation; but the Council had decided not to accept it, considering that Mr. Carmichael had really acted as President for some months, and had exerted a good influence on the Association and done good work for it. The Council thought that they should retain him as President for the session, especially as it would not be, as usual, a full session, because they would have no visits—only the ordinary meetings at which papers would be read. The Association had taken pride in Mr. Carmichael's promotion.

A LETTER FROM MR. CARMICHAEL.

The HON. SECRETARY (Mr. James Cubie) read the following letter to the Association from Mr. Carmichael:

I thank you sincerely for the honour you have conferred upon me in electing me to be your President, and in retaining me as such for the present session, although so far removed from the centre of our meetings. I assure you I greatly appreciate your kindness, and it shall be my endeavour, through the Secretary, to keep myself in touch with all the transactions during the remainder of the session, and to serve to the utmost of my ability the interests of the Scottish Junior Gas Association (Western District).

I shall, if all goes well, endeavour to be present at the Annual General Meeting, and, if at all possible, perhaps at one meeting before then. I hope, also, to prepare a short Presidential Address, to be read at one of the later meetings. Our original programme contained perhaps the most attractive feature to some—several interesting and instructive visits; but, as you are aware, they have had to be cancelled for the present, owing to the European crisis.

Mr. Hislop, of Uddingston, has very generously intimated his desire to give a medal to be awarded to the author of the best paper read during the session. The Association cannot be too grateful to Mr. Hislop and those honorary members who have in the past given these medals. They have materially assisted the Council to procure papers from among our own members, and so prevented our having to too frequently resort to outside friends for papers. This session only the annual lecture (now an institution) will be given by an outside friend—Mr. Cranfield, to whom our best thanks are due; the other six papers being given by our own members. This is a very healthful sign, and one of which I am proud; for in bringing the members forward to

prepare and read papers, we are achieving one of the great objects of our Association.

During the present session two of our members have merited our hearty thanks for the reading of papers before Senior Associations. I refer to Mr. Purves, who contributed to the transactions of the Institution of Gas Engineers, and Mr. Littlejohn to the Irish Association of Gas Engineers. We are all naturally delighted at the recognition given to the Junior Associations by the Institution of Gas Engineers; but at the same time we must admit that we were rather disappointed that so little time was given Mr. Purves for the reading of his paper—only parts of it being read, and practically no time given for discussion. However, we hope that this will be remedied should the opportunity be given to the members of Junior Associations in subsequent years to contribute to the transactions of the Institution of Gas Engineers.

On the motion of Mr. JOHN WILSON, it was agreed to send a reply to Mr. Carmichael, thanking him for his letter, and expressing the good wishes of the Association to him in his new sphere of labour.

THE ASSOCIATION'S ROLL OF HONOUR.

Mr. FULTON announced the resignation from the Council of Mr. George Braidwood, of Coatbridge, who, he said, had been a very useful member of the Association, and had occupied the position of Secretary at one period for four years. The Council had decided to co-opt in his stead Mr. Malcolm Littlejohn, of the Glasgow Lighting Department. The Council had also decided to hang up in the meeting-room of the Association a roll of honour containing the names of members of the Association who were serving with His Majesty's Forces.

On the suggestion of Mr. JAMES M'GHIE, it was agreed to include the roll of honour in the records of the Association.

AWARDS FOR PAPERS.

The CHAIRMAN intimated that the Adjudication Committee had given their award in connection with the papers read during the previous session. The medal given by Mr. S. B. Langlands, of Glasgow, had been awarded to Mr. James B. Stewart, of the Street-Mains Department, for his paper "Notes on the Commercial Distribution Side of the Gas Undertaking." The second prize, given by the Council, had been awarded to Mr. David T. Marwick, for his paper "Heating of Retort Settings."

THE METHODS OF CALORIMETRY.

Mr. MALCOLM LITTLEJOHN then read the following paper—

GAS AS AN ILLUMINANT.

From the time when Murdoch first used gas, up to within recent years, it has been considered simply as an illuminant. Naturally, therefore, the basis used for evaluating gas was its lighting value. It is only within recent years that the value of coal gas as a heating agent has been made use of; and it has been accompanied by great progress in the industry. The reason, of course, was that, for most purposes, gas was, and still is, more expensive than coal. For many purposes, and where very high temperatures are necessary, gas only can be employed and has been used for some considerable time. In the iron and steel industry, the waste gases from the blast-furnaces have been collected and used, first for heating the blast and later for raising steam and even for generating electricity. With the rapid rise in the demand for steel, new and more rapid methods of producing steel than the old cementation process had to be adopted; and in order to obtain high temperatures, sufficient to melt steel, gas-fired furnaces had to be used. Producer and water gas were employed principally for this purpose; and as they had no illuminating value, they had no interest for gas managers.

With the threatened competition of electricity for lighting, the gas industry had to bestir itself, and many attempts were made to get better light from gas than simply by the flame alone. It is interesting to note how gas and electricity copied each other. The idea of lighting by means of electricity was obtained from the discovery that an electric current when passed through a thin platinum wire raised the wire to a white heat. When the idea of lighting by gas used simply as a heating agent came to be tried, a mantle was made of platinum. The electric industry, on the other hand, knowing that the light from the gas-flame was due to incandescent carbon, tried carbon instead of platinum, and thus evolved the carbon filament lamp.

The investigations of the gas people led to the discovery that heated lime, when it was heated to a very high temperature indeed, gave a most brilliant light; hence the so-called lime light. Then the discovery of Welsbach gave us just what we had long been looking for; and the electric industry followed us up with the Nernst lamp, which was, however, soon superseded by the metal filament lamp. Improvement has been along parallel lines, and necessarily so, because the means of attaining the end are the same—viz., the heating of some body to incandescence. Electricity cannot compare with gas for heating purposes. It is therefore highly improbable that we have reached the end of our tether so far as gas lighting is concerned; but unless the gas industry is prepared to spend, and spend lavishly, they are likely soon to be outdistanced by their rival.

DEVELOPMENT OF THE HEATING PROPERTIES.

With the discovery of the incandescent mantle the question of burning the gas to get the maximum amount of heat from it had to be studied; and the study amply repaid itself in the number of processes in which it was found gas could be economically employed. I think I am right when I say that more gas is used for purely heating purposes than for lighting purposes; and of that employed for lighting, only a small percentage is used without the incandescent mantle. Thus the old idea of gas solely as an illuminant has practically disappeared, and with it the necessity of valuing gas by a standard of illumination. Hence it is that at this time we find the gas industry discussing the question of the determining the value of a gas by its heating value rather than by its lighting value. I hope therefore that this necessarily short and bald account of the methods employed in finding the heating value will be of some little interest to the Association.

MEASUREMENT OF HEAT.

The measurement of quantities of heat by any method has been styled calorimetry; and there is perhaps no department of scientific research in which experimental skill is more constantly or severely tested. The estimation is based simply on the measurement of some effect attributed to heat. Naturally, therefore, the general methods adopted are suggested by the two most common effects—viz., change of state and change of temperature, known as latent heat and thermometric calorimetry respectively.

Latent heat calorimetry embraces the methods which are founded on the fusion of solids or the condensation of vapours and the reverse operations. Depending as it does on the latent heat of fusion or evaporation, this method requires the use of fixed temperatures only, and therefore does not necessitate the employment of a thermometer. This method has no interest for us except that it has suggested a unit—viz., the amount of heat necessary to evaporate a unit quantity of water from and at 212° Fahr. under ordinary atmospheric pressure. This unit has never come into general use, although in engineering we have fuels classified according to their evaporative power—*i.e.*, according to the number of pounds of water which 1 lb. of fuel can, under normal atmospheric pressure, evaporate from and at 212° Fahr. This unit is simply the calorific value in B.Th.U., divided by the latent heat of steam (965·7) or 1536·5 calories.

In the second method, depending on the change of temperature, the estimation is reduced to the observations of temperatures and masses; and the thermometer becomes the instrument of prime importance. Hence the name thermometric calorimetry. To this class belong all the methods used in estimating the calorific power of gases.

THE QUESTION OF THE UNIT.

The first question confronting us in the measurement of quantities of heat is what are we to measure them by—what is our unit to be? We only know heat by its effects. If we know how it affects a certain body, then we can measure the quantity of heat by its effect on a known quantity of that body. Water is the the body which we choose; and unit quantity of heat is defined as the quantity of heat required to raise unit mass of pure water through one degree of temperature. Unfortunately there are two different systems of units used in measuring quantity and two different scales of temperature. If the gramme (or kilogramme) system of units is used and the centigrade thermometer, then the unit is called the "calorie" (spelt with a capital C or a small c, according as the kilogramme or gramme is used as the unit). I do not know what orthographists might say to such a convention, but the saving in confusion would be well worth the extra time spent in writing gramme-calorie or kilogramme-calorie according as the gramme or kilogramme was referred to. Using the system of units adopted in this country, unit quantity of heat is defined as the quantity of heat required to raise 1 lb. of water through 1° Fahr., and is known as a British thermal unit (B.Th.U.). I have come across books in which the B.Th.U. was defined as the heat required to raise 1 lb. of water through 1° C. For this reason some engineers have introduced the term thermal units Fahrenheit (Th.U.F.) instead of B.Th.U.—thus clearly indicating that the Fahrenheit scale is being used. The great pity is, of course, that we do not adopt the decimal system of units. Apart from the facility of working, we should save duplication of terms and the necessity of having tables of comparison. The relative values of Th.U.F. per cubic foot and calories per cubic metre, and the constants required to change one to the other for comparison, are given in all books on the subject.

Before passing on to a description of the calorimeters in general use, it may not be out of place to say a few words on the reasons for choosing water as the standard substance, in preference to any other substance—*e.g.*, air. To begin with, it is the commonest chemical compound in the world, and it is fairly easily purified. For this reason it was adopted as the standard for fixing the so-called "fixed points" on a thermometer—viz., the freezing and boiling points; and this is a second reason for using water in calorimetry. It has been found also that for all practical purposes the specific heat of water is the same for all temperatures, from freezing-point to boiling-point—that is to say, the number of heat units required to raise 1 lb. of water from 32° Fahr. to 33° Fahr. is practically the same as that required to raise 1 lb. of water from 211° Fahr. to 212° Fahr. Lastly, water has a greater capacity for heat than most other common substances—that is to say, the amount of heat required to raise 1 lb. of water 1° Fahr. is greater than that required to raise any other common body through 1° Fahr. This being so, we take water as our standard substance; and we call the ratio of the amount of heat required to raise 1 lb. of a substance (say, lead) through 1° Fahr. to the amount of heat required to raise 1 lb. of water through 1° Fahr., the specific heat of lead. The specific heat of water is,

of course, unity. Once we realize what specific heat really means, there is no further chance of making the mistake so commonly made of confusing temperature and quantity of heat.

The whole science of calorimetry was founded on the determination of specific heats, the latent heat of fusion, &c. The methods elaborated for this purpose were adopted by chemists in the study of thermo-chemistry for the determination of the heat of chemical reaction; and the determination of the calorific value of a fuel is the determination of the heat of reaction of the compound which we call a fuel and the oxygen of the atmosphere.

Calorimeters in General Use.

The original method of procedure was to make the reaction take place in a vessel such as a test-tube immersed in a known quantity of water, and observe the rise in temperature. But to try a fuel in this way would have given but poor results, as the escaping products of combustion would carry off too much heat. The method adopted therefore was to invert the containing vessel and cause the escaping gases to pass through the water and be robbed of their heat in the passage. This was the principle of the calorimeter of Thompson; and he obtained his oxygen supply from potassium chlorate and potassium nitrate mixed up with the fuel. Combustion was never complete, and the introduction of other bodies vitiated the result. This method was improved by another man named Thomson, who maintained combustion within the vessel by forcing oxygen gas into it. This type of calorimeter is still in use for the evaluation of solid and liquid fuels.

Berthelot's Calorimeter.

The bomb calorimeter of Berthelot was a decided advance on the previous two. It consists of a very stout vessel which can be totally enclosed, and into which the fuel (solid, liquid, or gaseous) is introduced, together with oxygen gas under pressure; the charge being ignited by means of an electric current passing through a platinum wire. It is found that much higher temperatures are reached owing to combustion taking place very rapidly—in fact, with almost explosive violence. When the fuel to be tested is a gas, the volume of the bomb is first ascertained, it is filled with gas, and then exhausted to a pressure of a few millimetres of mercury, and again filled with gas at normal pressure and ordinary temperature. It is now reckoned as being full of pure gas. Oxygen is then pumped into the bomb, and the pressure at which it is put in depends on the gas. The object to be aimed at is complete combustion, with just sufficient oxygen over to act as a diluent and prevent the reaction from proceeding too quickly. If the dilution is too great, combustion may take place too slowly, or even not at all. Two or three tests may have to be made to find what gives the best result. The bomb, having been filled, is immersed in a known quantity of water, which is kept thoroughly stirred to obtain a uniform temperature. The temperature of the water is taken and noted at frequent intervals for a few minutes, to find out the rate of change, and then the charge is ignited by means of an electric current. The voltage and current used give the amount of heat due to the wire during ignition; and this quantity must be subtracted from the total value found. The water is kept properly agitated, and its temperature taken at regular and frequent intervals till from 5 to 10 minutes after the maximum temperature has been reached. The calorific power of the gas is then calculated from the weight of the water in the calorimeter and the rise in temperature, which is corrected for radiation.

A very large correction has to be made for the heat required to raise the temperature of the calorimeter bomb and accessories, gas, stirrer, and thermometer, &c., from the original to the maximum temperature. This is done by adding a certain amount (called the water equivalent of the calorimeter) to the weight of the water in the calorimeter. The water equivalent is the weight of water which has the same thermal capacity as the vessel, &c. The radiation correction is got from the rate of cooling in the observations taken after the maximum temperature has been reached. The reason for this procedure is apparent when we consider what really happens. The temperature of the water gradually rises to a maximum; but during the rise the water is losing heat by radiation and conduction—the difference in this loss and the gain from the bomb causing the rise in the temperature. But there comes a time when the loss equalizes the gain; and we get the maximum, which remains so long as there is equality, after which the temperature falls. Furthermore, the thermometer will always be slightly behind the temperature of the water in its indications—being too low when the temperature of the water rises and too high when the temperature falls; so that the highest temperature of the water will never be indicated by the thermometer.

The radiation correction is determined by observing the rate at which the calorimeter cools throughout the range of temperature of the experiment. It is therefore advisable to have this range as small as possible, for then we can take the radiation as proportional to the difference in temperature between the calorimeter and the surrounding air, and the whole loss by radiation and conduction will be approximately equal to that which would occur if the calorimeter had been at its mean temperature throughout the whole time of the experiment. If the rate of cooling at the mean temperature be observed, then, from the known water equivalent of the calorimeter, the quantity of heat lost per second at this temperature will be known; and this, multiplied by the time of the experiment, will give the radiation correction. It is therefore advisable to have as small a range of temperature as possible by having as much water as possible; and as this diminishes the sensitiveness of the operation, a very delicate thermometer must be used to counteract this loss of sensitiveness.

Two very ingenious methods of avoiding the radiation and conduction error are those of Rumford and M. N. Heschus, of Petrograd. Rumford's method is to find the maximum temperature by a preliminary experiment, and then start with his water as much below the temperature of the room as the maximum temperature is above it. While the temperature of the water is rising to the room temperature it is taking in heat from the room, which amount is just balanced by the amount given out in rising from the room temperature to the maximum temperature. This works exceedingly well in practice.

Heschus' method is to keep the temperature of the water constantly at the room temperature by the addition of water at a lower (known) temperature, and the amount of heat is obtained from the amount of water at the lower temperature required to maintain the equality. This method has the additional advantage that it eliminates the necessity for making a correction for the water equivalent of the calorimeter.

The calorific value of the gas is then expressed by the formula

$$\text{Th.U.F. per cubic foot} = (T\,(W + w) + R) \div V.$$

where T = observed rise of temperature.
R = correction for radiation.
W = weight of water used.
w = water equivalent of calorimeter, &c.
V = volume of gas used at normal pressure + room temperature.

If there is any sulphur or nitrogen in the gas, sulphuric acid and nitric acid may be formed; and corrections will require to be made accordingly. The amount of each will have to be found by dissolving the contents of the bomb in water and titrating, and precipitated with barium nitrate, and a deduction made for the sulphuric acid and an addition for the nitric acid. The formula then becomes, Th.U.F. per cubic foot =

$$(T\,(W + w) + R - S + N) \div V.$$

Where S = heat given out in the formation of sulphuric acid.
N = heat taken in in the formation of nitric acid.

The Féry Calorimeter.

For expeditious work with the bomb calorimeter, M. Féry has invented the Féry bomb calorimeter which differs from the ordinary bomb calorimeter in having no water. Instead, the bomb is held in position by means of constantan discs, and the galvanic action between the constantan and the iron of the bomb and the constantan and the cold outer jacket is used to energize a small millevoltmeter, which is graduated to give direct readings of calorific value. It is claimed that this apparatus has an accuracy of 1 in 300, or 0·3 per cent.

The Junkers Calorimeter.

For the determination of the calorific power of gases, however, the simplest and best method is that which was first used in the Junkers calorimeter. In this method the heat generated by the combustion of the gases by a suitable burner is used to raise the temperature of a stream of water flowing at a known constant rate. Measurements are taken of the volume of gas burned, the quantity of water which flowed through the calorimeter during the time of the test, and the temperatures of the water at its inlet and outlet, also the temperature of the escaping products of combustion.

The calorimeter consists essentially of a combustion chamber surrounded by a water-jacket which is traversed by a great number of tubes for conveying the hot gases from the combustion chamber to the outlet. To prevent loss by radiation, the water-jacket is surrounded by a closed annular air-space in which the air cannot circulate. The whole apparatus is constructed of copper of great conductivity, and is as thin as is compatible with strength. The water enters at the bottom of the water-jacket and leaves it at the top; while the hot combustion gases from the burner enter the tubes at the top and leave at the bottom. This ensures that the gas, as it leaves the tubes, is deprived of the last of its heat by the cold entering water; while the water at the exit is raised to the highest temperature by meeting the hottest of the gases. This, together with the large surface of thin copper between the gases and the water, ensures that all heat is extracted from the gases which leave the calorimeter at almost atmospheric temperature. In order that the rate of flow of water may be constant, the water is supplied from a vessel which has an overflow; and by keeping a supply to this vessel such that there is always some overflowing, the water head is kept constant, and therefore likewise the flow is constant. The temperatures of the inlet and outlet water are observed by delicate thermometers reading to 1-10th of a degree. A series of baffle-plates is arranged at the top of the water-jacket to ensure thorough mixing, and therefore, as far as possible, constant temperature, of the outgoing water. A throttle valve is provided at the gas-exit, by means of which the flow of gases can be reduced, but not stopped. The temperature of the outgoing gases is also taken. The water from the combustion of hydrogen and hydrogen compounds condenses in the tubes and falls into a circular gutter, from which it can be drained and measured.

Care must be taken when a test is going on that water is flowing through the waste-pipe from the supply vessel, and also that no air is left imprisoned in the water-jacket when it is being filled

with water. In some of the latest patterns a special tube is provided for this very purpose. A suitable rate of flow for the water can be fixed after the gas is lit. The rate of burning of the gas, which is burned in a bunsen with a quiet flame, will depend to a large extent on the quality of the gas being tested—the rate must be constant and known. The water rate is adjusted to give a temperature difference of inlet over outlet of from 20° Fahr. to 30° Fahr. The test is started, and the readings are taken after the steady state has been reached—*i.e.*, after the thermometers have reached a temperature from which they do not appreciably vary. Readings are taken at regular intervals during the test. As an example, if the inlet temperature is 16° Fahr., and the outlet 42° Fahr., the gas consumption over a given period 0·1 cubic foot, and the water collected weighed 2 lbs., then the value of the gas in Th.U.F. per cubic foot is $[2 \times (42-16)] \div 0{\cdot}1 = 520$ Th.U.F. This is what is known as the gross value. The net value is obtained by measuring the quantity of water condensed in the tubes and subtracting its latent heat from the gross value.

It is to be noticed that we do not take any account of the water equivalent of the calorimeter, and likewise no allowance is made for radiation, which is regarded as negligible. This is not so. It is too difficult to find the loss by radiation. This is said to have been proved in two ways. In Germany, a test was made by burning pure hydrogen; and the results obtained showed an average efficiency of 99·5 per cent. Practically the same efficiency was found in America by inserting an electric coil heater in the calorimeter, in place of the gas-flame, and producing electrically a known quantity of heat in the calorimeter. However much we might wish these efficiency tests to be correct, we must discount them somewhat, as neither can be said to be quite suitable for this form of calorimeter.

The Boys Calorimeter.

From time to time different experimenters and different makers have brought forward calorimeters which are simply modifications (makers say improvements) on the Junkers. The first of these was Boys, who simply so arranged it that the two thermometers reading inlet and outlet water temperature were side by side; and he advised that readings of the outlet temperature should be taken two or three minutes after the corresponding inlet; the interval being the time the water took to flow through the calorimeter. He tried to further minimize the fluctuations in temperature of the outflowing water.

The Sargent Calorimeter.

The Sargent calorimeter of America differs only in small details; the most noticeable being a device whereby the meter hand, in passing the zero point, completes an electric circuit through an electro-magnet, which effects the change-over of the tipping bucket on the outlet water.

Dowson's Calorimeter.

Dowson—the pioneer of the water gas industry—is also responsible for a calorimeter similar to Junkers, but designed (so he says) for accuracy with greater simplicity of construction.

The tendency to increase the path of the water seems to have taken the fancy of some of the makers; and we find Sugg coming forward with a double instead of a single water-jacket; the gas passing through an annular space between the two jackets instead of through tubes.

The Simmance-Abady Calorimeter.

The Simmance and Abady calorimeter followed the same idea; the water going down and up three times before escaping. Constant flow is kept by observation of a water-gauge. This calorimeter was widely used in this country; but was unfavourably reported on by the Americans, who, when they tested its efficiency with hydrogen gas and an electric coil, found it to have over 100 per cent. efficiency. The calorimeter was an old type one, too; so one can have some idea of the value to put on their efficiencies.

The Boys Official Calorimeter.

With the passing of the London Gas Act of 1905, a gas calorimeter for official testing by the Metropolitan Gas Referees had to be obtained which would be accurate within reasonable narrow limits. The calorimeter adopted was one made by Boys. The special feature of this one is that the water passes through a coil with special arrangements for absorbing heat, which is placed in the very free passage of the exit gases, and a very small amount of water is required to fill the calorimeter. Two flat luminous flames are used instead of a bunsen flame.

The Simmance-Abady Improved Calorimeter.

The Simmance-Abady improved calorimeter follows the same idea as the standard one of Boys in reversing the order of things in the original Junkers. A still further refinement by the same firm is to saturate the air entering the burner with aqueous vapour. It is claimed that the escaping gases, since they are passing over wet surfaces, are saturated with moisture, and therefore so much heat is carried away in the aqueous vapour required to complete the saturation of the gas. If the ingoing air is saturated, the loss on this account will be avoided.

Naturally, if gas undertakings are to work on a basis of calorific value, some ready means of indicating this value at any or all hours of the day is necessary. For this purpose we find numerous automatic calorimeters.

The Junkers Automatic Calorimeter.

The Junkers automatic calorimeter is an ordinary Junkers calorimeter with a differential electric thermometer, and so arranged that the temperature and calorific value are the only variables; and therefore the former is a measure of the latter. To determine the difference in temperature (or calorific power) thermo-electric couples are used at the inlet and outlet, with a voltmeter which indicates, on a suitably divided scale, the calorific power, which, as the flows of water and gas are constant, varies directly with the difference in temperature.

The Simmance-Abady Recording Calorimeter.

In the Simmance-Abady recording calorimeter the medium to be heated is air instead of water; the cold air passing over one limb and the hot air over the other limb of a differential recording thermometer. As these two have opposing effects on the pen lever, the rise recorded is due solely to the heating of the air by the gas, and it is claimed that this is not affected by changes of atmospheric pressure. Mechanical devices maintain a movement of the pen point exactly proportional to the calorific value.

Féry's Continuous Calorimeter.

In the Féry continuous calorimeter a series of nickel-constantan thermo-couples are used—one set being heated by the flame, and the other set being in the air current to the flame. The current generated by the thermal effect on the junctions is thus independent of the actual temperature being proportional to the difference of temperatures of the junctions, as in the Simmance-Abady recording calorimeter.

The Sarco (Beasley's) Recording Calorimeter.

In the Sarco recording gas calorimeter the gas is burned within a well-radiated chimney which forms one limb of a U-tube; the other limb being maintained at ordinary temperature. The difference in the temperatures of the two limbs is made use of to give a continuous record of calorific value.

Hempel's Flame Calorimeter.

Among many other calorimeters which have from time to time been put on the market, one which in its likeness to the Lowe's jet photometer will recommend itself to gas managers is the Hempel flame calorimeter. This depends on the fact that the greater the heating power the larger the flame, because the greater amount of oxygen is required for combustion. The gas is burned at a standard fixed pressure, and the calorific power is got from the height of the flame as indicated by a graduated chimney carefully standardized by means of gas of known calorific value.

Féry's Flame Calorimeter.

Another similar instrument has been devised by M. Féry. He makes use of the fact that the velocity of the current of the waste products through the chimney encircling the flame is proportional to the heating power of the gas burned. The device is extremely simple, and consists of a cylinder connected to the base of the burner chimney in such a manner that the air supply is drawn through the cylinder, and, accordingly, varies in velocity in relation to the speed of the waste products, and hence to the calorific power of the burning gas. At the base of the cylinder an anemometer, suspended from its centre of gravity by a wire, is so placed that the ingoing air flows round it. The anemometer responds to the varying intensities of draught, and by angular displacement records on a specially calibrated arc the prevailing calorific power. As always for correct results, the uniform flow of gas to the burner is essential.

It has frequently been tried to find methods for calculating the calorific value of a fuel from a knowledge of its constituents, and good working results are obtained for gaseous fuels by assuming all the carbon burned to carbon dioxide and all hydrogen in excess of what is necessary to combine with the oxygen of the compound to form water burned to water. This, of course, means a chemical analysis; and if a chemical analysis must be done, then it seems to me the easiest method would be to determine once for all the calorific values of the ordinary constituents, which are comparatively few in number. From the percentage composition obtained from the analysis and the known values of each of the constituents, the calorific value of the gas would be obtained sufficiently accurately for all practical purposes.

Discussion.

A short discussion followed the reading of the paper; the Chairman suggesting that something might be said on the necessity of a calorific value standard.

Mr. John Wilson (Falkirk) congratulated Mr. Littlejohn on his paper. It might be termed a "Bovrilized" edition of the literature of calorimetry for the last ten years. Their thanks were due to the author for putting the subject before them in an abridged form. He would like to know from Mr. Littlejohn why Boys used a union jet in his calorimeter in preference to a bunsen flame.

Mr. J. P. Stewart said his experience of calorimeters had been that of an observer. He wondered if Mr. Littlejohn could give them any idea of the recording calorimeters; also—and it was perhaps germane to the discussion—he would like to ask some of the scientific gentlemen present if they could not find an easier method of telling the general public something of heat values without using scientific terms. Their difficulty with their consumers was to explain what gas was in comparison with something else. The consumer asked perhaps for some comparison between gas and steam engines, between the gas and coal furnace. They, in answer, explained the value of gas in terms of British thermal units. The consumer scratched his head, and did not understand. He (Mr. Stewart) wanted a scientific man to give them some

simple formula to tell consumers in an easily understood manner what they meant by the calorific value, or heat value, in gas.

Mr. JAMES BELL (Kirkintilloch) asked the author if in his experience of calorimeters he had found difficulty from the action of deposits on the tubes giving false results.

Mr. F. MELLOR (Glasgow) could not say he had tried what he might call the academic type of calorimeter. He considered that in public works apparatus of this kind could be disregarded. To commence with, he considered it would be difficult to get a chemist to carry out work with apparatus of the kind, and the amount of money wasted in testing gas in this manner would not be beneficial to the firm.

Mr. F. L. M'LAREN (Dumbarton) said his experience with calorimeters had been confined to the more obsolete ones, and he knew all the troubles connected with them. He had recently had the privilege of going through the laboratories of the Armstrong Ordnance Factory, which he thought were under the charge of an old member of the Association. This gentleman spoke very highly of the bomb calorimeter, and said it was really strange to find what good results were obtained when things were connected-up electrically. He had just had the pleasure of paying the President a visit at Nottingham, and there he was struck with the amount of electricity used for different purposes. The laboratory was fully equipped to get the most accurate measurements, including the calorimetry of the gas. He thought the paper a valuable contribution to the transactions.

The PRESIDENT, referring to Mr. Littlejohn's statement that "gas was, and still is, more expensive than coal," said it was more an assertion than a fact. With regard to calorimeters, he had had some exprience with them. It seemed to him that in the Simmance and Abady calorimeter the liability to personal error was far too great. The Boys calorimeter was always very fair, and gave very good results. It was some simple reliable calorimeter that was wanted.

Mr. W. GRAFTON thought that Mr. Littlejohn's reference to the comparative cost of gas and coal was unfortunate. He was surprised to find the author had made his paper so elementary.

Mr. LITTLEJOHN, in reply, said that, with reference to Mr. Wilson's question as to the Boys calorimeter, he was not quite sure why the jets were used. One reason was that more radiated heat was obtained from the luminous flame than from the bunsen; also it allowed of a more dumpy instrument being used than the usual tall one. He informed Mr. Stewart that he had not had any experience of recording calorimeters. With regard to the difficulty of explaining values to the consumer, he thought he would even make a worse attempt than Mr. Stewart. As to Mr. Bell's question regarding deposits, the difficulty was not great; but certainly if deposits were formed, false results would be the effect. Mr. Mellor's remarks on the academic class of calorimeters and the troubles of the chemist were difficult to understand. Chemist should find the calorimeters he had described sufficiently easy to work. He, too, understood that the bomb calorimeter was one of the most accurate. As far as the Simmance-Abady calorimeter was concerned, it might be very good; but the fact that it used air instead of water was, he considered, against it. One could get water pure, but never air. He again repeated emphatically that gas was dearer than coal; and he pointed out to Mr. Grafton that, in regard to the elementary nature of his paper, it was useless to go on to anything new until they understood what was already known.

Treating the Surface of Concrete.

One of the "Wrinkles" contributed to the last annual meeting of the Pacific Coast Gas Association was by Mr. A. S. B. Little, who gave the following advice as to treating the surface of concrete: "Gas companies use concrete and cement in larger quantities every year for construction work. There has been great difficulty in protecting the concrete, because it is porous and permits moisture to permeate it. Painting the surface has proved ineffective, because the alkali in the cement saponifies the oil in the paint. In addition, porosity of the cement causes suction, which tends to destroy succeeding coats of paint applied; and the only effective method of stopping suction, and preventing chemical reaction, is to treat the surface of the cement with a solution of zinc sulphate, using sulphate and water in equal parts, by weight—that is, 8¾ lbs. of zinc sulphate to a gallon of water. When this is applied to a concrete surface, a reaction takes place between the zinc sulphate and the free lime as deep as the solution penetrates the concrete. The products of this reaction are calcium sulphate and zinc hydroxide, precipitated in the pores of the concrete—two practically insoluble pigments, both neutral. This physically fills the voids and pores and lessens the suction properties of the concrete, and chemically neutralizes the free lime in the cement. Following this priming coat, after it has had about 96 hours to dry, the surface should be wiped with a brush, and then painted with two coats of a good cement paint containing no linseed oil, but made with a vehicle consisting of good grinding varnish."

London and Southern District Junior Association.—On Thursday afternoon the members are to pay a visit to the meter-works at Chelsea of Messrs. George Glover and Co., Limited. The next meeting at the Westminster Technical Institute will be on Friday, the 27th inst., when an address will be given by Mr. W. M. Mason, the Secretary of the British Commercial Gas Association.

ELECTRICAL REMOVAL OF TAR FROM GAS.

At the Annual Meeting of the American Gas Institute, a paper, on "An Electrical Process for De-Tarring Gas," was submitted in the Chemical Section by Mr. F. W. STEERE, of Detroit (Mich.). The following are some extracts from it.

The object of this paper is to give a brief outline of the development of a commercial process for the precipitation of suspended particles from gas by high-tension alternating current, and the practical application of this process to the removal of tar from coal gas and from producer gas.

As the early experiments with high-tension discharges for precipitating suspended matter from gases have been reviewed quite thoroughly in recent articles by Professor W. W. Strong, Dr. Cottrell, and others, only a brief mention of them will be made here. The phenomenon appears to have been first discovered as early as 1825; but very little, if any, effort was put forth to make practical use of it. From the first the precipitation of smoke seems for the most part to have claimed the attention of experimenters.

The question is naturally asked why this method of purifying gases has not long since been in commercial use. Possibly the answer is found in the fact that, though the phenomenon may be readily demonstrated on a laboratory scale with very simple apparatus, many serious difficulties were encountered in the various attempts made to develop commercial apparatus embodying the same principles, but capable of continuous operation with little attention.

The process recently developed by Dr. Cottrell shows what can be accomplished in precipitating dust. The Cottrell process consists in rectifying high-tension alternating current on rotating switches driven by synchronous motors, giving an intermittent unidirectional discharge. A plant using this process has recently been completed for precipitating the dust from the cement-works of the Riverside Portland Cement Company, Crestmore (Cal.); and, according to recent reports, it is giving excellent results. Mr. H. A. Humphrey seems to have been the first to use high-tension electric discharges to precipitate tar. Prior to 1897 we learn that he was using a static discharge within a small glass vessel through which he passed a known volume of gas, for making quantative determinations of the tarry matter carried by it.

In 1911 work was started along these lines in the research laboratories of the University of Michigan, at the suggestion of Professor A. F. White. It consisted for the most part in repeating the experiments of the early investigators and in attempting to apply the Cottrell process to the precipitation of tar from coal gas. The results of these preliminary investigations were given to the gas fraternity in a paper entitled "The Electrical Separation of Tar from Coal Gas," by Messrs. A. F. White, J. W. Hacker, and F. W. Steere, which appears in the "Proceedings" of the Michigan Gas Association for 1912.*

While engaged in this research work, the author became convinced that, with a suitable arrangement of electrodes and apparatus, alternating current might be used instead of rectified current. The complications and difficulties of rectifying alternating current of from 40,000 volts to 80,000 volts on synchronous motor-driven rotating switches will be readily appreciated. By the use of alternating current, the synchronous motors and rotating switches would be eliminated as well as the leads carrying the high-tension current from the transformer to the rectifier and from the rectifier to the electrode connections. Further, with the simple use of alternating current the transformer may be mounted on the ionizer, one terminal may be grounded, and the other connected directly to the electrode terminal. With terminals and connections completely enclosed, so that no high-tension parts would be exposed, and with no moving parts requiring attention or inspection, the element of danger would be absolutely eliminated.

An opportunity was provided at the Detroit plant of the Semet-Solvay Company to work out these ideas and develop the theory on which this work is based. This theory, though far from complete, has proved sufficiently accurate to guide us in perfecting a tar-removing process which is in commercial use to-day.

In attempting to outline briefly the electrical action, we must keep in mind first that the gas molecules themselves possess both positive and negative electrical constituents which can be separated by X-rays, beta and gamma rays of radium, brush discharge from points, corona discharge from wires raised to high potential, ultra-violet light, &c. This process of separating the neutral gas molecules into electrically charged parts or ions is called "ionization." It is outside the scope of this paper to attempt to discuss the ionic theory; but it should be noted that ions as such are very unstable, and cease to exist—that is, recombine to form neutral molecules—almost the instant they are outside the ionizing influence. A very few molecules are continually splitting-up, presumably because of the trace of radio-active substances found in most gases as well as in the atmosphere.

Professor Millikan, of the University of Chicago, has studied the movements of a small drop of oil between two oppositely charged condenser plates when attacked by atmospheric ions. The drop receives a charge when atomized; so by throwing on and off the electrical field, the drop is made to beat up and down between the plates. The instant an ion attaches itself to the drop the fact is made known to the observer by its change in

* See "JOURNAL," Vol. CXIX., p. 825.

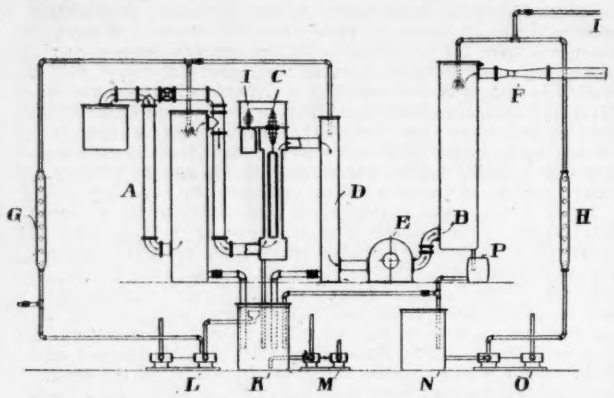
speed. This is just the condition we bring about in the electrical de-tarrer. The gas carrying the minute tar globules is swept into an intense ionizing field. Billions of gas molecules on every side are being torn apart. The resulting ions rush madly about in their effort to recombine. The unsuspecting tar globules find themselves in a storm centre of unseen forces hurling them in every direction.

The time occupied in the passage of the tar particles through the electric field is brief, and it might naturally be supposed, as it heretofore has been, that an aimless to-and-fro movement of them would be the result of the applied energy. It would, however, be hard to conceive of a condition more favourable to impact between tar particles; and experience shows that, either because of this impact or for some reason as yet unknown, agglomeration results, and the dense tar mist is almost entirely dissipated, leaving relatively few large tar drops in its place.

No attempt is made to free the gas of these agglomerated tar particles while it is still in the ionizing field. The apparatus is so arranged that everything is swept on into some form of mechanical extractor, where complete removal is effected with very little power loss. The Doherty centrifugal tar extractor worked very well to accomplish this; the old type of Pelouze and Audouin machine also became a very efficient tar extractor when placed after the ionizer.

The whole process may be summed up thus: It is practically impossible to free the gas from tar in the extremely fine state of subdivision which naturally results from rapid condensation. There is no difficulty in removing relatively large drops; and the electrical treatment simply converts the fine mist into the large drops.

A diagrammatic sketch of the experimental plant built at the Detroit Coke-Ovens is shown in the accompanying illustration.



Electrical De-Tarring Plant at the Detroit Works of the Semet-Solvay Coke-Oven Company.

The plant was not at first built complete as shown, but was added to and altered as the work progressed. The course of the gas may be readily seen by referring to the diagram. From the hydraulic main it passed either to a small washer-cooler A, or is bye-passed directly to the ionizer C, depending on the temperature desired for the test. After the ionizer came the mechanical extractor D, of which various types were tried. This apparatus was all placed on the suction side of the motor-driven exhauster E. Following the exhauster was a second washer-cooler B, where the final cooling was effected. Measurements of the gas volume were made with a Venturi meter F. The capacity of the plant was about 30,000 cubic feet of gas per hour. All the work was done on the rich gas—that is, the gas given off during the first six or eight hours of the coking period. To ensure complete recovery of ammonia, and in other respects to duplicate as far as possible the condensing system used at the Detroit coke-oven plant, two sets of cooling coils were used—one (G) for cooling the circulating liquor from the washer-cooler A and from the mechanical extractor when the liquor was circulating through it, and the other (H) for circulating liquor from the washer-cooler B. The make-up water was added by the pipe I to the B system, and overflowed to the A system. When the A liquor was up to strength, it was pumped to the weak liquor storage-tank. With regard to the other portions of the plant, J is a high-tension transformer, K is the tar-well on the A system, with the liquor pump L and the tar-pump M on either side; while N and O are the liquor well and the pump on the B system. P is the naphthalene decanter.

Extensive use was made of the filter-paper method of studying the condensed matter carried by the gas. This consists of aspirating a known quantity of gas through two thicknesses of filter-paper; the resulting stain indicating relatively the quantity, and to some extent the quality, of the suspended matter. With the ordinary methods of condensing and cleaning, quantitative determinations by this method are unreliable, and more especially with producer gas, as an appreciable quantity of the very fine tar mist will pass readily through two thicknesses of paper. When the gas carries large quantities of tar mist, the aspirator bottle will be full of the dense brown fog which has passed through the papers. More than 1200 of these tests were made in the course of the work; and though practically white papers were used, we believe we have more reliable and conclusive evidence of the completeness of the tar removal which will be mentioned later.

The best results were obtained with the gas entering the ionizer at a temperature of from 65° to 80° C. (149° to 176° Fahr.). There was every indication, however, that with gas not saturated with water vapour the electrical action would be fully as effective at very much higher temperatures. Since this action is purely electro-mechanical in so far as it effects the tar, the higher the temperature of ionization the more condensate will come down with the subsequent cooling. If the lower temperature condensates proved troublesome, a second treatment at a lower temperature could be used.

A very interesting development was the effect on the gasman's old enemy—naphthalene. Naphthalene by itself in the gas-works is quite a harmless, and possibly a valuable, bye-product. The trouble is all in the company it keeps. When mixed with enough tar to act as a binder, it is exceedingly troublesome; but when the tar is removed before the naphthalene condenses in appreciable quantities, the real cause of the trouble is eliminated. This segregation was brought about as follows: Washer-cooler B was sealed in a barrel through a 3-inch pipe. The circulating liquor was drawn from the bottom of this barrel, cooled in pipe-coils, and returned to the top of the apparatus. It was found that with the foul gas entering the ionizer at about 70° C. (158° Fahr.) the naphthalene vapour was condensed in washer-cooler B, where the gas was cooled, and the crystals were carried out of the apparatus through the 3-inch pipe with the liquor into the seal barrel, and immediately came to the surface. The separation of the crystals and liquor, even in this small vessel, was almost perfect. After several weeks' run, there was not the slightest indication of any deposit in the cooling coils or liquor lines. The gas was cooled in the washer-cooler B to from 16° C. to 25° C. (60° to 77° Fahr.). Picric acid tests which were run to determine the naphthalene carried by the washed and cooled gas checked invariably with the tables giving the theoretical naphthalene saturation at the observed temperature. The whiteness of the naphthalene crystals recovered, and the fact that there was absolutely no indication of any deposit in the coils or pipe-lines, we consider proof conclusive of the complete freedom from tar.

The two most valuable constituents of commercial light oil are benzol and toluol. The absorbing power of tar for these oils increases as the temperature decreases. With the tar as a fine mist, the surface of contact between the tar and the condensable hydrocarbon vapours is a maximum. It follows theoretically that if the tar mist is agglomerated to larger particles at relatively high temperatures the tendency for these oils to become absorbed by the tar is greatly reduced; and if this is followed immediately by a complete removal of the tar, this absorption of light oil by the tar is reduced to a minimum. Considerable work was done along these lines, which undoubtedly established this theory within the range of our observations. Unfortunately we were unable to get gas above 80° C. (176° Fahr.) entering the ionizer; but analysis showed that the tar precipitated with the gas entering the ionizer at this temperature contained but a trace of light oil content. Light oil is, of course, not made by this process; but these experiments have shown beyond any reasonable doubt that the percentage of light oil carried by the gas, and hence its illuminating power, can be very materially increased. In coke-oven practice, this has a distinct commercial importance with the increasing value of benzol as a motor fuel, and of toluol for use in the manufacture of explosives.

Cleaning producer gas for use in gas-engines is one of the later developments of this process. Producer-gas tar is very much more pitchy than coke-oven tar, and the tar mist particles hardened at very much higher temperature. The tar mist carried by this gas when rapidly condensed, as is necessary in a compact plant, was found to be in such an extremely fine state of subdivision that a large percentage of the tar passed readily through two thicknesses of filter-paper. It is this extreme fineness and relative hardness of the tar particles which makes the complete cleaning of producer gas by purely mechanical means a physical impossibility without an excessive power loss.

Arrangements were made with the Ford Motor Company of Detroit to try this process on the producer gas driving their large gas-engines. At the outset many unlooked-for difficulties were encountered which required considerable time and study to overcome. Had it not been for the attitude taken by Mr. Edward Gray, the designer of the engines, in giving us every opportunity to study these problems, we might have a very different report to make at this time.

The electrical process was eventually put in run at the Ford plant on Jan. 21, 1914; and up to the present it has not been out of service one minute while the plant was running. All the difficulties which were in any way due to tar have been entirely eliminated. The regular operating force start-up and stop the process with perfect confidence, and at no time has it required any special attention.

In conclusion, I wish again to call attention to the fact that this method of attack goes to the source of all the difficulties—that is, the almost molecular fineness of the tar particles which persist in flowing along with the gas in defiance of all mechanical scrubbers and washers. An enormous amount of time and study has been required to bring this process to its present stage; but, notwithstanding the various difficulties, we now have in commercial operation a plant which requires no attention, is self-cleaning, and is started or stopped at will by the regular operators.

The value of this electrical tar-removing process to the illu-

minating gas industry is as yet problematical; but it presents very interesting possibilities. Its adoption would make practicable a somewhat higher illuminating power with a given gas than is obtained from the same gas when the tar is removed in the usual way. By its use, followed by a washer-cooler, tar-free naphthalene can be condensed and removed from the gas without causing stoppages in the condensing apparatus. The tar can be completely removed from the gas at any desired point in the gas condensing and scrubbing system. The complete removal of tar, prior to condensing the gas, will make a relatively clean weak liquor possible.

For the bye-product coke-oven industry the process promises to be of value in connection with the direct method for the manufacture of ammonium sulphate, as well as for its possibilities as a means for recovering naphthalene and increasing the yield of benzol and toluol. The commercial plant for de-tarring producer gas which has now been in continuous and successful service at the Ford Motor Company for several months has demonstrated beyond all doubt the value of the process for this branch of the industry. With these possibilities, it seems not unlikely that this process may eventually play an important part, not only in cleaning producer gas, but also in the manufacture of coal gas.

A LECTURE ON TOWN-GAS ENGINES.

Before a crowded and thoroughly appreciative audience, at the Westminster Technical Institute, Vincent Square, S.W., last Friday evening, Mr. W. A. Tookey delivered the first of a course of three lectures on the operation, erection, and selection of "Town-Gas Engines," which had been arranged by the London County Council in conjunction with the London and Southern District Junior Gas Association. The lecturer explained, by way of preface, that he thought it best to begin at the beginning, because though he might in this way tell them things that many were already aware of, these things might at the same time be new to some of those present. A large number of lantern slides illustrated the various points made and the different engine parts which were described.

It had been announced by Mr. Tookey in his syllabus that in this first lecture practical notes would be given upon pistons, rings, cylinders, lubrication, meter circulation, ignition, bearings, flywheels, pulleys, valve-gear, clearances, working temperatures, economical operation, gas-regulation, governing, "hit-and-miss" and "variable admission" systems, &c. This programme was faithfully carried out, though the task would have been a very formidable one for a less able exponent of the gas-engine. Attention was confined to engines of the single cylinder horizontal type, of small and moderate output, such as are in common use for factory work, and which operate upon the four-cycle principle. Also, as at present the majority of gas-engines are governed on the "hit-and-miss" principle, the remarks referred more particularly to these engines, and not to those governed by one of the systems whereby the intensity of the explosive force is controlled at each cycle according to the load upon the engine, without the "hit-and-miss." Further, except where specially mentioned, the engines dealt with were of the type which do not have electric ignition.

Piston Rings.

While dealing with piston-rings, Mr. Tookey explained that, to be effective, these must be free to move within their respective grooves radially from the centre of the piston; and therefore from time to time it is necessary to remove the piston from the cylinder so as to get rid, by soaking in paraffin or otherwise, of all carbon deposits that prevent this free movement. At the same time, the back of the piston must be cleaned, and burnt deposit scraped off. Particular attention should be given to the ring nearest the back-end of the piston, as this, being placed in the hottest position, is always in the softest condition during work, and therefore the more likely to wear. It is usual to break-up this back ring (to prevent its being used inadvertently at any future time), and to shift all the rings with which the piston is fitted one groove backwards, placing a new ring in the then vacant front groove. This gives a chance for the new ring to become well bedded-down while being called upon to do the lightest work, and obviates the risk of leakage that would arise if all, or a majority, of the rings were to be renewed together. As to the cylinder, wear takes place more rapidly at the portion co-incident with the innermost position of the back-end of the piston, just at the point where the end piston ring reaches, and more particularly opposite the piston-ring joint. The ability to replace a worn cylinder without much difficulty or expense is a great argument in favour of the system generally adopted by gas-engine makers of casting separate liners renewable at will, besides which the metal used for the liner can be of special hard-wearing quality, while the foundry work is greatly simplified and sounder castings obtained.

The Question of Lubrication.

Further on, the fact was emphasized that by paying proper attention to the adjustment of the piston-pin bearing and to its lubrication, the date at which it will be necessary to have it trued-up on account of its wearing oval will be long delayed. Lubrication of the piston and the piston-pin was explained; and it was pointed out that efficient lubrication cannot be obtained unless suitable oil is used. It is, said Mr. Tookey, generally agreed that the best oil for the lubrication of these parts is one that is mainly a mineral oil of high flash-point, separated from the crude by the process of fractional distillation which frees it both from the oils of lighter boiling-points—the spirits and lamp oils—and also from the vaselines and incombustible matters. To give the oil more "body," and to render it greasier and less liable to be squeezed from between two sliding surfaces in contact under heavy pressure, it is usual to mix this mineral distillate with a small quantity of vegetable oil—such as castor oil—of a nature that will avoid the formation of acids and of gummy deposits under the influence of heat and exposure to air. In most cases very little difficulty is found in obtaining a suitable gas-engine cylinder oil; but in isolated instances this is a matter of deep concern, and causes much perplexity to the engine attendant. Some engines when fed with the same grade of oil as others with which no trouble is ever experienced, either churn-up the oil into a dirty sludge or during periods of rest become more or less seriously gummed-up. No rational explanation is usually forthcoming as to why a particular engine should be so sensitive when others of the same size and type are able to work well with almost any grade of oil of similar general characteristics.

In this connection, Mr. Tookey suggested (though with some diffidence, as the matter has not been thoroughly or scientifically investigated) that much depends upon the peculiar conditions under which each engine is operated. There must always be a rapid flow of heat from the back end of the piston in contact with the flame of combustion to its open end. In fact, the body of the piston is relatively cold, while the back end of it is extremely hot. The piston body is being continually cooled by the turbulent air within it, and also by contact with the cylinder walls, beyond which circulation of water is taking place. The cooling of the piston by the turbulent air is direct; but the cooling by contact with the cylinder walls is indirect, inasmuch as there must exist between the two a film of lubricating oil. It may, he thinks, be concluded therefore that when one of two similar engines gives more trouble than the other in the matter of selection of a suitable lubricant, the cause is to be looked for in the difference that may exist in the thickness of the oil film between the piston and the cylinder—in other words, in the amount of working clearance provided by the makers—or in the piston being extremely highly heated by early firing. A thin film of oil may be expected to be more effective from the point of view of heat transmission than a thicker film; and consequently, when an engine is fully loaded, or nearly so, and a maximum amount of heat must then be dissipated, the smaller the working clearance which will result in smooth working without undue friction, the less sensitive will the engine be in respect of lubricant.

Loss of Heat.

Pointing out that, of the total amount of heat taken into a gas-engine cylinder, from 70 to 75 per cent. is lost through the cooling water and the exhaust connections, the lecturer said many experiments have proved that there is no definite relation between the loss in the exhaust and that in the water. With a hot cylinder and restricted water circulation, the rate of heat flow to the jacket being diminished entails more heat being lost in the exhaust, and *vice versâ*. Whether the engine cylinder is maintained cool or allowed to reach a considerable temperature apparently makes no difference to economy, so long as the piston has just sufficient clearance to maintain the oil film between it and the cylinder wall to avoid undue friction, and so long as no pre-ignition occurs. It is usual, however, to endeavour to run an engine with sufficient water going through the jacket to make it possible for the hand to rest on the external casing without discomfort, rather than to allow too copious a flow of water, which would keep the cylinder jacket cold, and so cause the internal cylinder walls to be in closer contact with the sides of the piston.

It is, however, he continued, more important to avoid restricting the flow of water through the jacket to such an extent as to result in the temperature of the water flowing away from the jacket exceeding 140° Fahr. or thereabouts. At this temperature the carbonic acid gas present in the water is driven off, and the solid matters that have been held in solution in consequence of the presence of this particular gas, and which give the water the characteristic known as temporary hardness, are thrown down as silt, and eventually form scale which tenaciously adheres to the walls of the cylinder, interfering very considerably with the rate of transmission of heat from the metal to the water.

A Test with Tube Ignition.

The need was shown for giving careful attention to the connecting-rod bearings of an engine, and then some time was devoted to considering the crank-shaft, flywheel, and valve mechanism. Proceeding, Mr. Tookey said that, with fixed-point ignition, as in engines fitted with hot tubes, with and without timing-valves, there must be a certain strength of mixture which will produce the best results, both from the point of view of economy and of output. A practical method by means of which the proper position of the gas regulating cock can be determined is to run the engine at its normal speed and under normal conditions as far as cooling water temperature is concerned—for example, for a portion of the mid-day meal hour after a morning's run—and to load the engine with some unfluctuating resistance, such as the shafting load of the factory with the machine belts running on loose pulleys, or with the machines running without doing work. The engine should be kept under this load for a few minutes, till a certain quantity of gas is registered by the meter as being con-

sumed in so many minutes and seconds as can readily be noted with a little practice when observing the seconds dial of a watch. Then a second and third run should be made with a little more, and afterwards with a little less, gas, till the same quantity of gas has passed through the meter—the time occupied being noted as before. By this simple test, it can be determined whether it would, or would not, be advisable to diminish, or to increase, the richness of the charges in order to obtain the best possible economy.

By recording the figures secured, and by putting a centre punch mark upon the plate under the handle of the gas-cock, the test can be repeated at any future time; and in this manner it will be possible to compensate for wear, variations in quality of gas, &c., as may be necessary in order to maintain uniformly economical operation.

With "hit-and-miss" governed engines fitted with ignition tubes, many attendants have the idea that it is advisable to close the gas-valve a little when the engine is working under light loads, and to open it more when heavy loads are being dealt with. This is quite a mistaken notion, and often results in inefficiency at the lighter loads. When once the proper position of the gas regulating cock is determined, there is usually not the slightest need to vary it, when normal running conditions prevail. A possible exception to this general rule may apply when there is considerable restriction to the expulsion of the exhaust gases, due either to unduly long or tortuous connections or to the accumulation of deposit in the pipes. But in such cases the proper treatment is to remove the exhaust restriction, and not to regulate the gas-cock.

GOVERNING MECHANISM.

In the concluding portion of the lecture, Mr. Tookey dealt at some length with "hit-and-miss" governing; there being thrown on the screen a number of charts the explanations in regard to which were followed with close attention. With reference to this matter, he told his hearers it would usually be found that when several hits were followed by several misses, some portion or other of the governing mechanism was out of order. Probably there was an inordinate amount of play in the pins of the governor-levers or in the governor-sleeve, or perhaps the governor-spindle was dirty, either through grit or gummy oil. For regular speeds within the limits permitted by "hit-and-miss" governors, it is necessary to keep the parts clean and in good repair.

It is, he added, common knowledge that within recent years, mainly owing to the necessity for more regular driving for the generation of electricity for lighting purposes, "hit-and-miss" governing has been to some extent superseded by systems of throttle governing, whereby charges are admitted and fired at every cycle; but the intensity is varied to suit the load. A chart was shown, to give an idea of the relative regularity of speeds with the two methods of control. It would, said Mr. Tookey, be seen that, with variable admission governing, as the load falls, so the degree of irregularity diminishes; whereas the contrary is the case with "hit-and-miss" governing. It is evident, therefore, that engines governed by graduated charges are much to be preferred in respect of cyclical variation when steady running is imperative. Except at full load, however, the thermal efficiency falls off, and the engine requires more gas per unit of power developed; whereas with "hit-and-miss" governing the thermal efficiency is to a great extent independent of the load. But this comparative statement only refers to the indicated horse power developed, as it is well known that, owing to the decrease in mechanical efficiency, the rate of consumption on the basis of brake horse power always increases with the falling off of the output.

Practical Training of Engineers.

We have received from the Secretary of the Institution of Civil Engineers (Dr. J. H. T. Tudsbery) the report of the Special Committee on the Practical Training of Engineers, which has lately been adopted by the Council. The Committee included Mr. H. E. Jones and the late Mr. Walter Hunter; the Chairman being Dr. W. C. Unwin, F.R.S. Conferences were held with representative engineers; and at one of them Mr. W. Doig Gibb, Mr. Stanley H. Jones, and Mr. Edward Sandeman expressed their views on the training of men for the professions of gas and water engineering respectively. As the result of the conclusions and recommendations contained in the report, which will be more fully noticed in a subsequent issue, the Council propose to take steps to define more clearly the requirements contemplated by the bye-laws with regard to the practical training of students, and of others who may seek election into the Institution; and they hope that the Civil Engineers Appointments Board may become a serviceable medium of communication between eligible young men who wish to obtain practical training and members of the Institution who may be willing to afford to such persons opportunities for so doing, whether in the capacities of pupils, apprentices, or assistants under agreement.

Mr. William Erasmus Darwin, J.P., the Chairman of the South Hants Water-Works Company, and a Director of the Antwerp Water-Works Company, who died on Sept. 8, aged 74 years (son of the famous Charles Darwin, F.R.S.), left estate in his own disposition of the gross value of £99,696, of which the net personalty has been sworn at £90,787.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Destruction of Coke-Oven Bricks by Salty Coals.

SIR,—I have read with much interest the letter in your issue for Oct. 27, by Mr. Colquhoun, relating to the corrosion of coke-oven bricks, due to the alkaline constituents in the coal.

My experience rather bears out the remarks in your columns of the 13th ult., in the article headed "Event and Comment," that such corrosion is less when a highly silicious brick is employed.

This was most noticeable on an oven recently let-down for examination here, and which was partly constructed of highly silicious bricks from the Continent, and bricks from an English district containing a moderate percentage of alumina—about 14 per cent. The two types of bricks were chequered in the oven, and the corrosion in the material containing alumina was most marked, while the silica brick was intact.

It may be that the refractoriness of the material plays an important part in the action of the salt, when combined with the wet coal and time of contact; but it demonstrates that the lime-bound silicious brick (which is somewhat difficult to obtain in this country) is more suitable to withstand the combined circumstances applicable to coke-oven practice.

W. CHANEY, Engineer.

Saltley Gas-Works, Birmingham, Nov. 2, 1914.

What is a Fact?

SIR,—Mr. Cooper puts us in order; and it is time. What foolish people tar distillers and the trade generally are!

A ton of coals produces 2½ gallons of crude benzol. That is Mr. Cooper's fact. One ton of coal produces, on an average, 10 gallons of coal tar. That is "Gas Engineer's" statement. So if Mr. Cooper is right, one-fourth part of coal tar is crude benzol. Mr. Cooper's fact!

I want someone to tell me who is wrong.

Nov. 5, 1914. J. A.

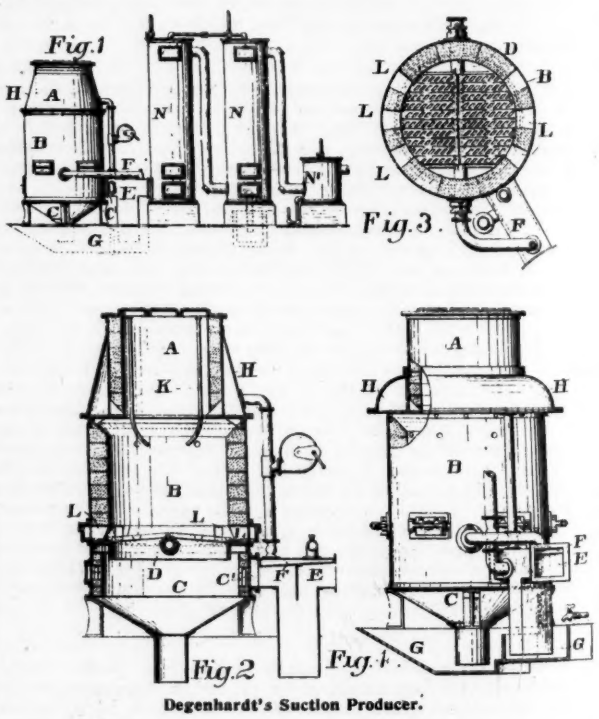
REGISTER OF PATENTS.

Generating or Producing Gas.

DEGENHARDT, W. R., of Kalgoorlie, Western Australia.

No. 22,618; Oct. 7, 1913.

This invention relates to down-draught suction-gas producers of the kind comprising a generating chamber, a fuel-charging chamber, a grate at the bottom of the generating chamber, a gas-chamber beneath the grate, an annular air supply chamber, and a vaporizer connected to the air supply chamber. The object aimed at is to provide apparatus in which continuous running is insured for long periods without the need of discontinuing the operation for the removal of the spent fuel and ashes or other refuse, and without the use of secondary air cocks or the like.



Degenhardt's Suction Producer.

Fig. 1 shows the general arrangement of a producer plant for use in conjunction with a gas-engine or internal combustion motor—the apparatus being shown connected to scrubbers and an expansion box or

boxes, from which the gas is drawn to the engine. Fig. 2 is a sectional elevation of the generator. Fig. 3 is a horizontal section. Fig. 4 is a front elevation, partly in section.

A is the fuel-charging chamber; B, the generating or combustion chamber; C, the gas-chamber; and C^1, the gas discharge tube leading to the scrubbers N, and thence to the expansion box N^1 before passing to the motor. The generator is cylindrical; the chambers A, B, and C being arranged one above the other and lined with fire-bricks or other non-combustible material. The fuel-charging chamber is furnished at the top with fuel feed openings fitted with removable covers; while in the bottom of the generating chamber B is fitted the fire-grate D, having fire-bars, below which is the gas-chamber C, furnished with a refuse discharge dipping into the water-lute G, and an ash-door fitted to the side of the chamber C.

The seal-pot E (at the side of the apparatus) is constructed somewhat T-shaped; and one end of it is connected to the gas discharge tube C^1, while its other end is connected, through the scrubbers N and expansion box N^1, to the suction pipe of the engine—the vertically arranged portion of the pot being adapted to dip into the water-lute G. A baffle-plate at the top intercepts the gas from the chamber B, to enable any ash to be collected in the water-lute G. The flash vaporizer F is formed on the top of the seal-pot, and a continuous water supply is fed to it through a funnel "in order to produce superheated steam for distribution inside the upper portion of the combustion chamber B."

The superheated steam and heated air are drawn from the vaporizer to an annular chamber or reservoir H, mounted on the top of the generating chamber, and thence the heated air and superheated steam are drawn into the generating chamber B through a series of holes formed in the top, enabling the superheated steam to be evenly distributed. A series of vertically arranged pipes K are supported by the top of the chamber A, and extend downwardly through the chamber into the chamber B, and are adapted to permit atmospheric air to be drawn into the latter.

At each side of the chamber B (slightly above the fire-grate) are openings L (preferably three each side), fitted with removable doors. These openings enable the spent fuel and ashes to be removed as desired. The doors are also furnished with poking holes, over which are suitable swinging covers, enabling bars to be inserted in order to poke the fire without having to open the doors. Fig. 2 shows that the fire-grate is set back from the wall of the generator, and that the wall of the generator chamber overhangs the openings L. Owing to this arrangement the glowing coke banks within the recesses and forms a protective layer, which prevents outside air entering the producer and impoverishing the gas when the doors are opened or poking rods are inserted to clean the fire-bars.

The cycle of operation is as follows: The seal-pot being connected upon one side by the scrubbers N and expansion box N^1 to the suction of the engine, and upon the other side to the gas-chamber C below the fire-grate, the suction of the engine causes air to be drawn into the vaporizer F, into which is fed a water-drip—thus producing superheated steam, which, together with heated air, is drawn into the chamber H at the top of the generating or combustion chamber B. The heated air and superheated steam are drawn downwards through the fuel in the combustion chamber B, and the resultant gases are drawn through the fire-grate into the gas-chamber C, and thence through the scrubbers to the engine or motor. Any ashes or other foreign substances entering the gas chamber C or seal-pot E are collected in the water lute G; while any tarry matter will be collected in the scrubbers N.

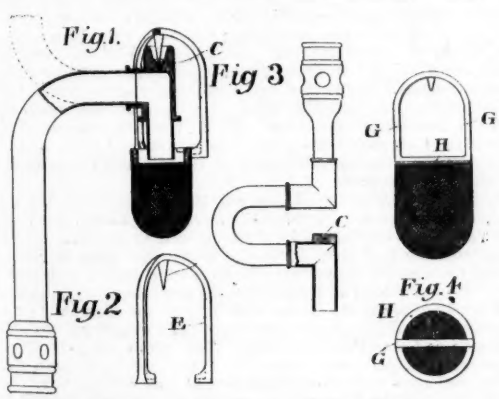
In charging and starting the generator the top covers and doors are opened; a good fire is started in the fire-grate; and the draught is regulated by the opening and closing of the doors. When the fire is well alight, fuel is added in the top of the chamber A, and as the fire works through more fuel is added until the generating chamber B is full. When the combustion is well established, the openings in the generator B are closed, and the vent cocks on the scrubbers and expansion boxes are opened. As soon as the engine starts running, more fuel is fed to the chamber A to within about a foot from the top. The water-drip is admitted into the vaporizer in quantity regulated to suit the moisture in the fuel.

Inverted Incandescent Gas-Mantles.

MYHILL, A. R., of Small Heath, Birmingham.

No. 28,572; Dec. 11, 1913.

So that the mantle may swing sidewardly upon the burner in any direction, the patentee proposes a single and central suspension point only between the burner and the mantle—preferably a point carried on the mantle frame—and a centralizing seating formed on the burner to receive the point. "The seating is a V recess truly formed on the burner central of the flame tube, and the point a spike or conical peg forming a rigid and truly central part of the mantle."



Myhill's Inverted Gas-Mantle Support.

Fig. 1 is a sectional elevation of a burner and mantle showing the suspension means applied to an ordinary pattern of mantle. Fig. 2 shows a suspension frame separated. Fig. 3 shows a modified form of burner fitting. Fig. 4 is an elevation and a plan of a special mantle frame.

The "primary constructive feature" of the burner is the centralizing seating C "truly and axially" in line with the flame tube of the burner. This seating is a recess in the burner, preferably of conical form; and two ways of forming it upon the burner are shown. The mantle is of ordinary construction—having outstanding lugs upon its crown ring. E is a frame, formed of three integral arms depending from a point or spike adapted to engage the centralizing seating C in the burner. The lower and free ends of the arms are formed with seatings to be engaged by the lugs of the mantle. The frame and spike are said to "easily adapt existing mantles to the suspension means;" but fig. 4 shows a special mantle where the spike is formed in one piece with arms G, which are also integral with the crown ring H of the mantle.

Purifying Coal Gas.

FABRY, R., of Sheffield.

No. 29; Jan. 1, 1914.

The object of this invention is to remove from crude coal gas so much carbon dioxide and sulphuretted hydrogen that no more (even less) acid impurities—CO_2, H_2S, and HCN—will afterwards remain in the gas than will be sufficient to neutralize the ammonia then contained in it. These remaining acid impurities will thus be removed with the ammonia when the gas is further washed successively with weak ammoniacal liquor and fresh water.

For this purpose the crude coal gas, after being cooled down to as near as possible atmospheric temperature and practically deprived of all its tarry constituents, is washed in some "primary washer" with a combined solution of alkali carbonate (preferably potassium carbonate) and caustic ammonia of suitable concentration and sufficient in quantity to absorb all the free carbon dioxide and all the free sulphuretted hydrogen present in the coal gas with simultaneous formation of alkali bicarbonate and ammonium sulphide and hydrosulphide, all of which are retained in the washing solution.

The gas is then passed in the ordinary way through secondary washers, in suitable numbers, fed successively with weak ammoniacal liquors and fresh water; and it issues from the last of them practically freed from all the impurities it previously contained—namely, ammonia, carbon dioxide, sulphuretted hydrogen, and hydrocyanic acid.

The ammoniacal liquor, obtained by cooling the crude coal gas and by washing it in the secondary washers, is collected, settled, and distilled in the ordinary way—preferably with the addition of milk of lime; the ammonia expelled from the stills being converted either into ammonium sulphate or concentrated ammoniacal liquor.

The spent combined solution flowing from the primary washer is now first allowed to separate (by settling) from the naphthalene which it has collected; and it is then subjected to partial distillation in a dissociating still of suitable construction—preferably the system forming the object of a separate patent, No. 337 of 1914—in which dissociating still carbon dioxide and sulphuretted hydrogen are set free owing to the dissociation of the alkali bicarbonate and ammonium sulphides caused by the gradual heating of the combined solution.

The original compounds of the combined solution—the alkali carbonate and the caustic ammonia—are thereby regenerated; and after the distilled solution has been thoroughly cooled down to the temperature of the coal gas entering the primary washer (or even to a lower temperature), it is again pumped in the primary washer and goes through the same cycle of chemical and physical changes over and over again.

Provided efficient means are adopted to prevent the coal gas issuing from the primary washer and the gaseous mixture issuing from the dissociating still from carrying away a portion of the ammoniacal alkaline combined solution, the patentee says the losses of same are negligible.

The noxious gases issuing from the dissociating still consist largely of carbon dioxide and sulphuretted hydrogen; but they also contain a small percentage of ammonia, which it pays to recover. To this effect the noxious gases are preferably passed through an acid lye of ammonium sulphate, which will absorb whatever ammonia is carried by them; or when sulphate of ammonia plant is established at the gas-works or bye-product coking plant, the gases from the dissociating still and the ammoniacal vapours from the ordinary ammonia stills are mixed and passed all together through a common saturator for the purpose of converting the whole of the ammonia from both sources into marketable ammonium sulphate, and of uniting the sulphuretted hydrogen contained in both the noxious gases and the ammoniacal vapours for subsequent treatment by partial or total combustion.

The noxious gases from the dissociating still (whether or not mixed with ammoniacal vapours) are, after being deprived of their ammonia, either partially burnt in a Claus kiln, for the purpose of recovering their sulphur in a marketable form, or else completely burnt with excess of air, whereby their sulphur may be converted into sulphuric acid by any known process. The latter method of dealing with those gases will naturally, the inventor points out, be the best adaptable when sulphate of ammonia is manufactured in comparatively large quantities, requiring corresponding quantities of sulphuric acid.

This process of purifying coal gas can also be used in plants where the coal gas is thoroughly cooled down before passing it through an acid lye of ammonium sulphate for the purpose of recovering its ammonia. In this case, however, only the bulk of the impurities (CO_2 and H_2S) can be extracted from the gas, owing to the fact that the ammonium compounds left in the gas, and which are decomposed by the acid lye of ammonium sulphate, produce free carbon dioxide and free sulphuretted hydrogen, which remain mixed with the coal gas and can only be extracted from it by means of ordinary dry purifiers. Even then the invention will, it is said, be applied advantageously whenever the yield and the quantity of recoverable sulphuretted hydrogen are

sufficient to justify its being converted into marketable sulphur or sulphuric acid.

The process of purifying coal gas described above could also, it is claimed, be carried out by washing the gas first with a solution of an alkali carbonate and, secondly, with a solution of caustic ammonia—both solutions being used and regenerated separately. No advantage is, however, obtainable thereby; while this alternative method would practically require a double outlay in apparatus and twice the power, heat, and cooling water required by the former described process.

Furthermore, a combined solution of sodium carbonate and caustic ammonia is said not to work so well as a combined solution of potassium carbonate and caustic ammonia, owing to the fact that the less solubility of sodium bicarbonate as compared with potassium bicarbonate necessitates the use of more diluted solutions when working with sodium carbonate, and consequently their rate of circulation is proportionately increased, with the result that the primary washer and the dissociating still, and all their accessory apparatus—such as settling tank, coolers, pumps, and the like—must be of increased size and cost; while the power, heat, and cooling water consumption are also correspondingly higher. For these reasons it is preferred to carry out the invention by means of combined solutions of potassium carbonate and caustic ammonia.

The patentee concludes his lengthy specification (which is not illustrated) by remarking: "I am aware that alkali carbonate solutions have been used before for extracting carbon dioxide from gaseous mixtures containing it, and that caustic ammonia, either gaseous or dissolved, has also been used before for extracting both carbon dioxide and sulphuretted hydrogen from gaseous mixtures containing both these gases; and to the separate use of either alkali carbonate solutions or caustic ammonia solutions for the purpose of extracting carbon dioxide and sulphuretted hydrogen from coal gas I lay no claim. I am aware that both alkali bicarbonate solutions and heterogeneous solutions of ammonium sesquicarbonate, ammonium bicarbonate, ammonium sulphide, and ammonium hydrosulphide have been separately dissociated by partial distillation, and thereby regenerated to separate solutions of alkali carbonate and of caustic ammonia; and to such separate regeneration of either or both of these solutions I lay no claim."

LEGAL INTELLIGENCE.

PUBLIC AUTHORITIES PROTECTION ACT.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Monday, Nov. 2.

(*Before Lords Justices* BUCKLEY, PHILLIMORE, *and* PICKFORD.)

Myers v. Bradford Corporation.

This was an appeal by the plaintiff from the judgment of the Divisional Court, affirming the County Court Judge at Bradford, in an action to recover damages in respect of alleged negligence of the defendants' servants.* The Jury found for the plaintiff; but the County Court Judge, being of opinion that the case was based on tort, held that on the authorities he was bound to enter judgment for the defendants. The Bradford Corporation Gas and Improvement Act, 1871, empowered the Corporation to acquire and carry on the gas undertaking of the borough, and to sell coke and other residual products resulting from the manufacture of gas. Plaintiff bought a ton of coke, which, on delivery, was, owing to the alleged negligence of the servants of the Corporation, precipitated through his shop window. He issued a plaint in the County Court claiming damages against the Corporation, but did so after the six months limited by the Public Authorities Protection Act had expired, and judgment was given for defendants, who claimed the protection afforded by section 1 of the Act. On appeal to the Divisional Court, the Judges did not agree. Mr. Justice Bray agreed with the County Court Judge that the negligence had taken place in the execution of a public duty or authority. He said the action was based on tort, and the substance of it was damage to the plaintiff by defendants discharging a public duty or authority of selling and delivering coke; and, as a public authority, the Corporation were within the benefit of such protection as was given by the Public Authorities Protection Act, 1893. Mr. Justice Lush, who dissented, expressed the view that, under the Local Act, the defendants were empowered to carry on the business of coke merchants, and the making of contracts was necessarily incident to their statutory powers. The action was based on contract—a contract in the course of trade. Defendants had, acting within their statutory powers, undertaken a duty towards the plaintiff; and as in the course of discharging this duty they had been negligent, the case was not one in which they had acted directly in the execution of a public duty, and therefore the protection of the Public Authorities Protection Act did not apply.

Mr. SCOTT FOX, K.C., and Mr. LOWENTHAL argued the case on behalf of the appellant; and Mr. M'CALL, K.C., and Mr. MASON were for the respondents.

Lord Justice BUCKLEY said the question was whether, in the act which the Corporation negligently did in the delivery of the coke to plaintiff's premises, they were doing an act "in pursuance or execution, or intended execution, of any Act of Parliament or of any public duty or authority, or in respect of any alleged neglect, or default in the execution of any such Act." Under the Act of 1871, the Corporation had power to make and sell coke; and it was said that it was their duty to sell coke for the purpose of carrying on the undertaking beneficially in the interest of the ratepayers. But when they entered into a contract with the plaintiff to sell him a ton of coke, did they do this in execution of any Act of Parliament, or any public duty or authority? What Act of Parliament was there which compelled them, or rendered it their duty, to sell the plaintiff a ton of coke, and what public authority was there in them to sell the ton of coke to him as distinguished from any other ton of coke to a proper person? There was none. There was no duty towards the plaintiff, though there was a public duty to sell the coke for the benefit of the ratepayers. In the absence of authority, he should say when the defendants were delivering the coke to the plaintiff they were not delivering in pursuance of any Act of Parliament or of any public duty or authority. There was no instance in which the Public Authorities Protection Act had ever been held to apply in a case where a voluntary contract had been entered into under statutory authority. There were cases where there was no contract at all. There were cases where there might be said to be a contract to perform a statutory duty—such as where a corporation were running tram-cars, and a contract was invoked on a passenger paying his fare. A contract was entered into when it was within the volition of the parties to enter into it if they pleased. There was no case in which it was freely at the option of the authority to make, or to refuse to make, any particular contract to which it had been held the Act applied. Here there was no statutory obligation on the Corporation to sell the plaintiff any coke. When they contracted to do so, they superadded to their statutory duty that which they might or might not do. When they superadded something voluntarily by way of contract, the Act did not apply. He was of opinion that the Public Authorities Protection Act did not apply.

Lords Justices PHILLIMORE and PICKFORD concurred; and the appeal was allowed, with costs.

* See "JOURNAL," Vol. CXXIV., p. 891.

BOSTON GAS-WORKS RATING APPEALS.

A Special Sitting of the Holland Quarter Sessions was (as briefly recorded last week) held at the Sessions House, Spalding, on the 29th ult., to hear appeals by the Boston Gas Company against the assessment made in 1913 upon certain lands, tenements, and hereditaments in the parishes of Boston, Skirbeck, and Skirbeck Quarter.

Mr. BALFOUR BROWNE, K.C., and Mr. R. W. CRACROFT appeared for the Company; while Mr. W. J. JEEVES, K.C., and Mr. HOWARD represented the Assessment Committee of the Boston Board of Guardians.

Mr. BALFOUR BROWNE, in opening, said that the statutory existence of the Company dated from 1856. Under section 25 of the Incorporating Act passed that year, the Company were authorized to supply gas; and Parliament took the usual precautions in the interests of the consumers of gas. First of all, it limited the amount the Company could charge for gas to 5s. per 1000 cubic feet, and it also limited the amount the Company could distribute among the shareholders as dividend to 8½ per cent. on the capital. Nothing happened until 1871, when the Company had to raise further capital. They obtained a Money Act in that year, and the capital was increased; but the dividend which was to be paid on the new capital was not to be 8½ per cent. as in the original Act, but 7 per cent. The total amount they could pay as interest was £2750; and the Company had been paying this. In 1885 the authorities rated the Company in three parishes. The principal part of the undertaking was in the parish of Boston; and there were two subsidiary parts in Skirbeck and Skirbeck Quarter. The rateable value fixed by the Assessment Committee was in Boston £1440, in Skirbeck £38, and in Skirbeck Quarter £19—making a total of £1497. All the important principles involved could be discussed in connection with Boston. What they had to arrive at was the rent which might reasonably be expected from year to year; and in cases like those of gas undertakings, a method had been adopted to find out by calculation what a company could afford to pay in rent. They would have to start with the gross receipts for gas, deducting the working expenses, and take off the tenant's charge. Thus they found out what rent the tenant could afford to pay; and this would be the basis of rateable value. But after they had obtained this their work was not done, because the Parochial Assessment Act said: "No rate for the relief of the poor in England and Wales shall be allowed by any Justices, or be of any force, which shall not be made upon an estimate of the net annual value of the several hereditaments rated thereunto—that is to say, of the rent at which the same might reasonably be expected to let from year to year, free of all usual tenant's rates and taxes, and tithe commutation rent-charge, if any, and deducting therefrom the probable average annual cost of the repairs, insurance, and other expenses, if any, necessary to maintain them in a state to command such rent." In 1912 the Assessment Committee thought they ought to make a fresh assessment; and instead of the figures of 1885, which had stood entirely until 1911, the valuer for the Assessment Committee rated the property thus: Boston, £3875 gross, £2500 rateable value; Skirbeck, £200 gross, £150 rateable value; Skirbeck Quarter, £68 gross, £50 rateable value—making a total of £4143 gross, and £2700 rateable value, as against a total rateable value of £1497. That was to say, the valuer had practically doubled the rateable value of the undertaking. In these circumstances, the Company appealed to the Assessment Committee, and said there was no ground whatever for increasing the rateable value. He thought the most startling figures he could give were these: In 1885 the total amount of the net profit of the Company was £2799; whereas in 1912 it was £2813.

Mr. JEEVES: That was after spending about £2000 on improvements. You must call this profit.

Mr. BALFOUR BROWNE said he was telling the Court exactly what the accounts showed. Out of this amount they had to pay their dividend; and upon the face of it, it was absurd to say that the value of the undertaking had been doubled. There had been no increase at all, and there could not be any, because they were a statutory Company. They could not divide one farthing more than £2750, even if they made a profit beyond it. It was the duty of the Company to reduce the price of gas if the profits were more than would pay the statutory dividend; and this they had done. The maximum price they could charge was 5s. per 1000 cubic feet. In 1912 they were charging 2s. 11d. per 1000 cubic feet, though coal was 15s. per ton. He was glad to say that the Company were now in a position to still further reduce the price of gas; and it would be lowered to 2s. 9d. per 1000

cubic feet. They therefore appealed against the increased assessment, on the ground that there was no increase of profits. There was no dispute about the gross rateable value—the only question arose under the words in the Parochial Assessment Act—"deducting therefrom the probable average annual cost of the repairs, insurance, and other expenses, if any, necessary to maintain them in a state to command such rent." They had books of account, and could show what they had spent in maintenance. His friend said that in one year they spent something on improvements. The duty of an undertaking such as this was to keep in first-rate condition; and it was also the Company's duty to maintain the concern in such condition that it could manufacture gas of good quality at the very cheapest rate. They had on occasions spent certain sums of money, not upon improvements, but in maintaining the hereditament in a condition to command the rent. There were certain repairs that could be carried out annually; but others were only done every few years.

The CHAIRMAN said he thought it would be very much better if the parties could settle the action out of Court.

Mr. *R. G. Shadbolt*, of Grantham, gave evidence regarding the management of the Boston Gas-Works, the improvements that had been made, and the details of the balance-sheet; and while he was doing so, there were frequent consultations between the parties concerned.

Mr. BALFOUR BROWNE subsequently stated that they had been able to arrange a settlement. The Court, he said, would understand that this settlement was a compromise; the appellants gave up their position, and the respondents gave up theirs. They had met half-way; and the arrangement was that the rateable value should be fixed at £2000 for the whole undertaking in the three parishes, and that each party should pay its own costs. Of course, the Assessment Committee had no right to bind themselves for any length of time; but it was understood that the settlement was not to be upset at once. The appellants were only conceding this for the sake of peace.

Mr. JEEVES said his clients had also made concessions for the sake of peace. They recognized that the appellants were a local Company, and neighbours. The figures agreed to were: Boston £1910, Skirbeck £62, Skirbeck Quarter £28—total, £2000. The previous figures were: Boston £2194, Skirbeck £74, Skirbeck Quarter £32—a total of £2300.

THE FELD WASHER PATENT.

In the Patents Court, last Friday, Messrs. R. & J. Dempster, Limited, of Manchester, applied for the suspension in their favour of a German patent of Herr Walther Feld, of Honningen-on-the-Rhine, for subjecting gases, in order to cleanse them, to the action of liquids.

Mr. ARTHUR GADD appeared for the applicants; and Mr. J. G. JOHNSON represented the administrators of the late Herr Feld.

Mr. GADD said that before Herr Feld died Messrs. Dempster had an agreement which gave them the sole right to manufacture in this country. Under the agreement they had manufactured machines for the Birmingham Corporation, the Liverpool Gas Company, and others. If an exclusive licence was granted for the term of the war, they were willing to pay a royalty of 7 per cent.

Mr. JOHNSON said he would agree to 10 per cent. for a non-exclusive and 12½ per cent. for an exclusive licence.

The COMPTROLLER said he would report to the Board of Trade.

A Serious Charge at Walton-on-Thames.

Before the Kingston County Bench, last Thursday, George W. Ross, until recently collector to the Walton and Weybridge Gas Company, was charged with having been concerned, with another person not in custody, in stealing three sums of £100 8s. 8d., £17 10s., and £97 7s. 4d., the money of the Gas Company. Mr. Crosby (who prosecuted on behalf of the Company) said that as there was another defendant who had not yet been arrested it would be necessary to adjourn the case after formal evidence. Mr. Thomas Price (Manager to the Company) swore to the information laid before the Court, which stated that Ross had been in the employ of the Company as clerk and collector for 22 years, and that he was in receipt of a salary of £170 a year. The information against the two defendants concerned alleged that the amounts specified in the charge had been received in payment of accounts, but had not been entered in the cash-book to the credit of the firms paying them. Witness added that accountants were now investigating the books. There was a large deficiency. Defendant complained that the case had been hanging about for six weeks, and said he pleaded not guilty to stealing the money. A remand was ordered until Monday next; the accused being admitted to bail in £200, and two sureties of £100 each.

Horwich and the Quality of Bolton Gas.—At the monthly meeting of the Horwich District Council last Tuesday, on the minutes of the General Purposes Committee, the question of the quality of gas supplied to consumers was raised; and it was moved that a deputation from the Bolton Gas Committee be invited to meet the Council to discuss the matter.

Marple Gas Undertaking.—At the monthly meeting of the Marple (Cheshire) District Council, the Chairman of the Gas Committee alluded to the satisfactory progress of the gas undertaking, and said it reflected much credit upon the Gas Manager (Mr. J. K. Law). For such a small district, it was remarkable that there should be an increase of 1,500,000 cubic feet compared with last year. The number of consumers had now reached 1225; and this total would be greatly increased when the district had been thoroughly developed as a Manchester residential suburb. The Chairman remarked that, on a strictly revenue basis, the gross profit worked out at £1725, of which £167 had been spent on capital works, £701 for interest on loans, and £698 for repayment of loans or reduction of debt, leaving a net profit of £187 on the year's working. They were now extending to Strines, and had 1½ miles of mains more than last year. The next thing would be that a new gasholder would very soon have to be put down somewhere in the district.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The War and the Present Position of the Company's Stations—Belgian and French Works during Bombardments.

The Half-Yearly Meeting of the Association was held last Tuesday, at the Cannon Street Hotel, E.C.—Sir CHARLES JESSEL, Bart., in the chair. The peculiar circumstances under which the meeting was being held naturally caused an unusually large number of the proprietors to attend.

The SECRETARY (Mr. R. W. Wilson) read the notice convening the meeting.

NO REPORT OR ACCOUNTS.

The CHAIRMAN: Ladies and gentlemen, I now rise to move—"That a distribution at the rate of 2¼ per cent. be declared upon the £4,940,000 capital stock, in respect of the half year ending the 30th of June last, and that the same be payable on the 14th of November, less income-tax, at the rate of 1s. 2½d. in the pound. Six months ago, through serious illness, I was unfortunately unable to preside at the half-yearly meeting; and so it is just a year ago since I had the honour of presiding over you. It is perhaps a model exemplar of the fluctuation of human affairs that I have to contrast what I had to place before you a year ago with the position at the present moment. A year ago I had the honour of submitting to you a half-yearly balance-sheet which, as I then pointed out to you, was a record one in the history of the Association; and now—only twelve months from that date—I have again to draw your attention to another record—something which has not happened before in the ninety years' existence of the Association. I cannot submit to you any half-yearly accounts, nor a scheme for the division of profits. You will, I think, easily understand how this situation has arisen. Within a very few weeks of the 30th of June, war was declared. Our communications with our stations were thereby interrupted; and not only was it impossible, but, in certain instances, it was not permissible, to have intercourse with these stations. Therefore no accounts can be presented to-day. I am not going to bother you by reading to you a clause in the Company's Clauses Consolidation Act which deals with this situation; but I think you will take it from me as true that, if we cannot present to you a half-yearly balance-sheet, with a scheme for the division of profits, no dividend can be declared. Thus it is that, instead of the motion that, under happier circumstances, I should have been pleased to submit, you have heard me propose a resolution in the terms of the notice distributed among you in calling this meeting.

THE BUSINESS OF THE SIX MONTHS.

I may say, however, that this motion of mine is well guaranteed from what we know of the situation during the six months. Our monthly returns have shown that the business up to June 30 last was quite as good as it was in the corresponding six months of 1913. I say nothing about our profits, because it is impossible to speak of them. It may be that, through the increase in the price of coal and the decrease in the market values of residuals, the profit we could have shown you would not perhaps have been as good as in the corresponding half year; but it was quite good enough to warrant our asking you to approve of the motion I have just had the pleasure of submitting.

PRUDENCE IN THE PAST.

Luckily for us, we are in the position to make this proposal, though having received little or nothing from any of our stations for many a month past, owing to the ample cash reserves we have at home. Very different would have been the position some years ago. When I first had the honour of being elected to this Board, we—invariably, I may say—had to borrow the money necessary to pay the November dividend. To-day we are in the fortunate position of being able to make this distribution without calling upon our bankers to advance us a single cent. [Applause.] There are many reasons for this position which I do not propose to go into; but one of them has been that, without any knowledge or thought of the dreadful situation that has arisen, the Directors long since felt it desirable that we should keep some of our powder dry. Therefore, it has been our custom over recent years to keep large sums on hand in London. Well, ladies and gentlemen, "out of nothing, nothing comes;" and I cannot say anything more about the half year which ended on June 30.

THE POSITION OF THE STATIONS.

However, I am sure that you who have attended here in such large numbers to-day would like a few words from me with respect to the present situation—the situation which has arisen since the date on which war was declared. There is only one station of ours which is not in the war area. It is a small station in Holland—that of Flushing. Through the energy of our Engineer there, it has been extended a great deal beyond the bounds of the town, and now practically includes about half the Island of Walcheren. But that is a comparatively small proposition; and I do not wish to encourage you to think there is any likelihood of a large dividend being payable from there. However, the island is exempt from the dire consequences of the war. In Germany, there is, first of all, the town of Hanover—the very first place this Association ever lit with gas on the Continent. The town of Hanover and the town of Linden (which are only divided by a river) have separate gas-works. The Association are, as it were, leaseholders in both instances to 1950; and, in both cases, the towns have taken over the works on our account till the end of the war. The Directors have had no communication from Hanover; and I cannot tell you any more than that. With respect to Berlin—the largest and most important asset of the Association—I daresay you will have seen in the newspapers an allusion to the fact that the German Government have "taken over the English gas-works" there. We have heard indirectly

that this is a fact—that they have put in a Government controller on the financial and commercial side, and also a Government controller on the technical side. We have had the advantage of having had access to German newspapers in which is the full text of a proclamation made with respect to all foreign companies working in Germany. This in itself seems to be perfectly satisfactory so far as we are concerned; and there is no reason on our part to complain of the German Government's action in this respect, because it is on similar lines to the action taken by our Government with respect to foreign concerns at work in this country. Then I come to Austria. You will perhaps remember that our stations in Austria are both small in number and of not very great importance—in fact, I expect, if a profit and loss account were made up between our liabilities to our Vienna pensioners and our profits from the stations in that country, it would probably be found we owed more than we had to receive. Therefore, one is not very alarmed as to what has occurred in Austria. I may say we have heard absolutely nothing as to what is going on at Prague, Brüx, Graslitz, Komatau, and Saaz. We have heard nothing about them, and can only presume that they are going on as usual, and that no disaster has happened to any of them.

A PROPRIETOR: What are we doing about the pensions, Sir?

The CHAIRMAN: We can have nothing to do with alien enemies, either by receiving or paying. We know nothing; so that I can tell you nothing. With respect to Belgium, we hear indirectly that at Brussels things are going on in a more or less normal manner. As I daresay you know, Brussels and the suburbs were taken without any fighting; and therefore nothing happened either to the gas-works or to the mains.

FORTY SHELLS IN ONE WORKS—A MANAGER'S DEVOTION.

I now come to our important station at Antwerp. We have three works at Antwerp—the big ones at Hoboken, the Dam works, and the Berchen works. Unfortunately, the works at Berchen were within the line of fire, and suffered bombardment at the hands of the Germans. No less than forty shells were placed in these works; but you will be glad to hear the damage done was not commensurate with the expenditure of ammunition. We hear indirectly that the furnaces were re-started some weeks ago, that one of the gasholders had to be repaired, and that the plant will be in full working order in about a fortnight from now. The other two works were unscathed. It must be mentioned that during the bombardment of the Berchen works, luckily we had as Resident Engineer there a gentleman by the name of De Vigne. He was almost, so to speak, born in the Association. His father served us well and faithfully before him. He himself is now an old "I.C.G.A." man. Throughout the horrible bombardment, when two of our workmen were killed, De Vigne remained on the works; and directly the bombardment was over, he emerged from the cellar of his house (which is situated on the works), proceeded to put things straight, and, within a few hours after the bombardment had ceased, was again beginning to supply Antwerp with gas. I need hardly say the Board had pleasure in passing a resolution which gave expression to their feelings of admiration for his conduct and that of his staff on that terrible occasion. This concludes my remarks with reference to the stations that are directly worked by the Association. We have, however, as I daresay is known to the proprietors, large interests in France, which are represented by shares in various and diverse companies. In the east of France, the most important station in which we are interested (we hold nearly the whole of the share capital) is the town of Nancy. The works so far as we know to-day have received no damage; and, beyond one or two of the streets which were bombarded for a few minutes, we have heard of no damage at all done to Nancy. There is, however, a town whose works belong to the Nancy Gas Company, situated a few miles back in the Vosges, called St. Dié. News has reached our office during the last forty-eight hours that St. Dié has suffered in the last few days bombardment for the tenth time, and considerable damage was done to the works. Pont à Mousson, the share capital of the gas-works at which is largely held by the Nancy Gas Company, has also been under fire; but no damage has been done to the works, and only one main has been broken. I then come to the other corner, which is perhaps under fire at the present moment. Lille—which is a large centre of population, and a most important town—is a place in which we have considerable interests, owning, as we do, shares in no less than three Companies—the Compagnie Continentale du Gaz, the Gaz de Wazemmes, and the Société Lilloise d'Electricité. What has happened at Lille, which is still under German occupation, we do not know. There are two other small towns—one Armentières, which is perhaps a little bigger than the other small one about 14 kilometres off—which were bombarded to a moderate extent. No great damage was done—in fact, the biggest damage was occasioned by the Germans who occupied the town, and blew up a bridge (on which was one of our big mains) before the British entered the town. Our last information is that the town is still occupied by the British, and, with the exception of lighting some of the communes in the neighbourhood, work is proceeding as usual. The Engineer there—Mr. Thumereau—stuck to his works with a large proportion of his staff, all through the German occupation, the fighting, and the British occupation. Other towns in France have hardly suffered at all. At the small town of Meaux, which was under fire during the battle of the Marne, the greatest damage was done by the British troops, who blew up the bridges over the Marne and at Trilport, and blew up the gas-mains with them. The staff (who had gone away from the works, and had ceased to manufacture gas, on the advice of the Mayor) returned very shortly afterwards when things were all right, and Meaux is now being supplied with gas in a more or less normal way. This deals with all the stations in which we are directly or indirectly concerned that have been in danger of any sort or kind.

THE LATE CHAIRMAN, AND THE NEW DIRECTOR.

I have to announce to you the death, since our last half-yearly meeting, of our old colleague, Mr. J. Horsley Palmer, who occupied, in such an able manner, for so many years, the position which I now hold. He resigned only a short time before his death; and the Board elected in his stead his son, Mr. H. G. Palmer, who is the fourth in generation to take his seat at the Board. I may say I specially welcome him here, being a great believer in heredity and a consistent advocate of nepotism—[Laughter]—at least so far as the Board of this Association is concerned.

THE STAFF AT HOME—A TRIBUTE TO THE SECRETARY.

I should like to say a few words with respect to the staff at home, having dealt with that abroad. You may well imagine that, with a revenue so decreased, one of our first anxieties would be to see where we could save money. But before we had come to any determination in this respect, I had a letter from our Secretary, Mr. Wilson, on behalf of the London staff. The letter I was pleased to receive. It was not altogether unexpected, knowing our staff to be the men they are; and it offered, in the most noble manner, to forego a portion of their salaries. What the Board did was this: We thought that it was not right to keep a large staff at home with very little to do. We sent away those who had been with us only a short time. We pensioned others who were almost ready for pensions, and in all cases those who have been pensioned have found other work to do. We also reduced the salaries of those still at work, beginning with the Secretary, by a proportionate percentage according to the salary received. Having dealt with everything I can think of relating both to home and abroad, I cannot finish what I have to say to you without a word or two with respect to the chief of our staff at home, Mr. Wilson. I have known Mr. Wilson all through his career in the capacity of Secretary. When I think of it now, the times of peace have seemed easy enough. Only the other day I was reading what Walter Bagehot wrote regarding the Prince Consort: "Everything has seemed to go so easily and so well that it has seemed to go by itself. But there is no such thing in this world. Everything requires anxiety, reflection, and patience." We know here, and we know well, this has been the case with Mr. Wilson. Trying, however, as the times of prosperity were, I think it requires adversity to show what is really grit in a man; and, though I expected it of him, no man has risen, no man could have risen, with better spirit and better courage than he has done to meet the situations of difficulty, doubt, and in some instances of despair that have come about through this unfortunate war. [Applause.] I beg, ladies and gentlemen, to move the resolution.

The DEPUTY-CHAIRMAN (Mr. Arthur Lucas) seconded the motion.

INQUIRIES BY PROPRIETORS.

Mr. W. WHITWORTH remarked that the Chairman had alluded to a proclamation that had been issued by the German Government which affected the works of the Association at Berlin. Sir Charles said it was practically the same as had been adopted in England; but he (Mr. Whitworth) would be glad to have a little detail.

The CHAIRMAN said, of course, if it were the wish of the proprietors, he could read the whole proclamation; but he thought it would bore them.

Mr. WHITWORTH said he did not want that, but he thought the Chairman might give a short statement.

The CHAIRMAN: The Secretary suggests I should read the second paragraph. It is as follows:

> By virtue of this proclamation, supervisors have been appointed to control numerous foreign undertakings of the nature specified, the duty of such supervisors being chiefly to ensure the business being carried on in a manner not inimical to German interests, and, in particular, to prevent money or other assets of the controlled undertaking either directly or indirectly reaching an alien enemy.

Mr. S. H. HARRIS asked why it was they had to deduct income-tax from the proposed distribution. He took it the reserve was accumulated out of past profits, and that on those profits income-tax had already been paid.

The CHAIRMAN replied that, as a matter of fact, the Board were not going to earmark this distribution as a payment out of anything in particular. It was taken as a profit the proprietors might have expected under normal circumstances. When the Board were in a position to make out a balance-sheet for the past half year, this distribution would take its place on account of dividend. The Board did not pretend that this was coming out of reserve, or dividend equalization fund, or any other fund. It was only a payment on account of probable profits. It was almost as certain as anything humanly could be that they did in the half year make profits large enough to pay this amount.

Mr. B. SCOTT inquired whether the Chairman could tell the proprietors the extent to which any loss on plant due to the war was covered by insurance.

The CHAIRMAN said the loss due to war was not covered. The cost of repair at the station at Antwerp where the Company had suffered to any considerable degree, they were told, would be about 60,000 frs., or (say) £2400.

Mr. SCOTT: The war unfortunately is not over yet.

The CHAIRMAN: No; and I am not going to make any prophecy regarding it. [Laughter.]

Sir JOHN RUNTZ remarked that the Chairman had given them as usual a very clear statement; but unfortunately they had no figures with which to deal. But he thought that the proprietors ought, under the circumstances, to be extremely satisfied with the statement they had heard. [Hear, hear.] Many of them who had followed the war closely had had anxious times as to the position of their works. It was a matter, however, for great congratulation to hear that even at Antwerp their loss was so small. He thought they ought also to congratulate the Directors upon their prudent finance which provided the money from which the proprietors were to receive a dividend on account. As to the probabilities of the future, those, should the war last a year or two, were the important matters from the proprietors' point of view. He had quite a number of friends who had a large stake in the Association, because they had felt that it was a concern in which they might have the utmost confidence. There was one point to which the Chairman, with his usual modesty, had omitted reference. This was as to the Directors' fees. They all realized that for Directors, when things were not going quite right, the anxieties were more than when things were going quietly and smoothly. But he should like to hear from the Chairman whether the Directors had, in the matter of fees, roped

themselves in with the employees, and had considered themselves as sharing in the effects of the war with the proprietors. He congratulated the Board upon the position of affairs in the circumstances. The proprietors were pleased to know that so comparatively little damage had been done; and he hoped this would be the condition in the future of the war.

The CHAIRMAN said the Board were grateful to Sir John Runtz for the way he had spoken of their labours. The Directors had, of course, reduced their fees in the same proportion as in the case of the salaries of the staff—that was to say, by 25 per cent. As to the future, unfortunately no one could say anything. They, naturally, had liabilities which they must meet—such as pensions, income-tax, and interest on debenture stock. But beyond these things he was sure that Sir John would excuse him for not going.

Mr. QUARTERMAIN: Have you insured against war risks?

The CHAIRMAN: No, Sir.

A PROPRIETOR asked how the Association stood with regard to the payment for works which they had sold.

The CHAIRMAN replied that Aix-la-Chapelle was fully paid for some time ago. Curiously enough, two or three days before war was declared, they received £12,000 from Vienna for the sale of some land there. It was a narrow thing; but the Association got the money. [Cheers.]

The motion was unanimously carried.

On the proposition of Mr. WHITWORTH a hearty vote of thanks was passed to the Chairman and Directors and to the officers and staff.

The CHAIRMAN, on behalf of the Directors and himself, acknowledged the vote; and Mr. WILSON also expressed gratitude for his colleagues in all positions, as well as for himself.

COLONIAL GAS ASSOCIATION, LIMITED.

A Good Year and Excellent Prospects—An Important Gas-Works Purchase—More Capital Necessary.

The Ordinary General Meeting of the Association was held last Tuesday, at the Cannon Street Hotel, E.C.—Mr. CHARLES HUNT (in the absence of Mr. Samuel Spencer) presiding.

The CHAIRMAN said he knew those present would share the great regret of the Board that their Chairman, Mr. Spencer, was unable to preside at the meeting, owing to the serious illness of his wife. In requesting him (Mr. Hunt) to take the chair on his behalf, he asked him to apologize for his absence. He (the Chairman) was sure that the shareholders' one feeling would be that of deep sympathy with Mr. Spencer, and their earnest hope for the complete and speedy restoration to health of his wife.

The SECRETARY (Mr. Alfred J. Kingdon) read the notice convening the meeting and the Auditors' report. The Directors' report and the balance-sheet having been taken as read,

The CHAIRMAN said Mr. Spencer had prepared a statement showing the position of the Association to date; and he would ask the Secretary to read it to the meeting.

The statement was as follows: When the Directors had the pleasure of meeting you on the last occasion, I ventured to say we might look forward to a very satisfactory year's working; and I feel sure the report and balance-sheet you have received have borne out what was then anticipated. Great prosperity existed in Australia up to the outbreak of the war; and since this deplorable event, although nearly every nation has suffered heavy financial losses through this awful scourge, Australia appears to be going on fairly well. Only a few days ago, the Chairman of the Melbourne Stock Exchange stated at their annual meeting: "That the war has caused less financial inconvenience in Australia than anywhere else in the world." I stated at the meeting last year that "our Association, with Australia's prosperity, must benefit;" and the balance-sheet now presented shows this result. In going through the figures for the past year, there is not a total in comparison with the previous year but what is satisfactory in the interests of the Company; and this, I feel confident, will be the case in even a more favourable degree for the current year. Our profit is about 10 per cent. better than for the previous year. But for this wretched, outrageous war, I have no doubt we could have increased the dividend. But we have thought it better to keep to the same dividend as last year of 6½ per cent., 3 per cent. of which was the interim amount, and 3½ per cent. is the final dividend for the year. I hope that the current year will enable us to increase the dividend; and very pleased I shall be, if it is my pleasure next year to see this brought about. Then the dividend will be at the same rate as it was some twenty years ago, when our prosperity was checked by the then disastrous failures of the banks, owing to the land boom, which caused such financial loss to the Colony. Even with a 6½ per cent. dividend, for an investment I think this is a very fine return, as is also the 5 per cent. debentures which we are ready to issue at par. You will notice in the report that the sales of gas over the previous year amount to 12 per cent.; and it is very gratifying to say that a further increase is shown by the returns received since the accounts were made up. We feel assured from the information so far to hand that, in the current year, our profits will be greater than in the past year. In the report, mention is made of the acquisition by the Association of two more works—Oakleigh and Footscray—at a price which works out to us at £835 per million cubic feet. Your Directors feel confident that these works will turn out a most satisfactory purchase. In regard to them, I should like to read part of a letter from an independent engineer, in which he says as regards Oakleigh: "You have acquired a magnificent business; and it is in a splendid district. The Footscray district is one of the best in the Melbourne area—a great industrial centre, clamouring for gas, and it will very soon double its sale." I might mention here that in the year 1910 the cost of our works was £2182 per million cubic feet, which was reduced last year to £1590. With the new works the cost per million will be again considerably reduced, bringing it down, in fact, to a very low figure for Colonial works. It will be necessary, to meet the cost of extensions, to issue further capital from time to time; and the Directors appeal with confidence to the shareholders and their friends to subscribe for this as a thoroughly satisfactory investment. During the past year, coal prices worked out about the same—21s. 6d. per ton; and it is thought that this figure will continue for the coming year. It has been suggested by the Australian Directors that, as early as possible, it would be well to divide the £5 shares into £1 shares, as these are more marketable in Melbourne. This we hope to bring about at a convenient time next year, when the shareholders will be called together to pass the necessary resolution. It will no doubt please you to know that the average make of gas per ton during the year was the satisfactory figure of 11,650 cubic feet; and the leakage was not quite 10 per cent. Turning to the balance-sheet, the profit for the year is £9795, against £8768 last year; the revenue from gas having increased by £5260, and from residuals by £779. The increase of expenditure is naturally somewhat higher; and about half of it is due to the Oakleigh works. It will be noticed that we have written-off for depreciation £1399; and this is over and above the amount charged against revenue for repairs and maintenance. The founders shares, you will notice, have been cancelled, and do not now appear in the balance-sheet. The £600 sanctioned by the Court as a cash payment was taken from the reserve fund; but as the sum of £391 was added to the fund during the year, the amount of the fund only shows a reduction of £209. The temporary loans at the Oakleigh works were taken over by us, of which £3250 is not payable until November next; and in the meantime we have to pay 5 per cent. interest. You may have noticed that £1486 appears in the balance-sheet as bank overdraft, which had to appear in adjusting the accounts in connection with the Oakleigh transfer. This has since been paid off. During the year, 774 additional meters have been installed, and 447 cookers fixed. In conclusion, I feel convinced that the past year's working will be considered by the shareholders as satisfactory; and I have confidence that the future years' results will be equally so.

The CHAIRMAN observed that the statement to which the shareholders had been listening with much pleasure was so clear and comprehensive that it was not necessary for him to add anything to it, unless it were to emphasize not only the satisfactory position of the Association as shown by the accounts, but also, and more particularly, the importance of the recent development of the business. The two purchases which were referred to in the report marked the commencement—it was no exaggeration to say—of a fresh chapter in the history of the Association. Hitherto their operations had been confined to a series of small undertakings, aggregating an output of not more than 100 million cubic feet of gas per annum. This had been increased by the acquisition of these two undertakings by fully 50 per cent., with the prospect of further and almost indefinite extension. They were both situated in the suburbs of Melbourne—one about four or five miles, and the other nine miles, from the city; and the shareholders all knew that it was mainly in the suburbs of a great town or city that increase of gas consumption was to be looked for. There were some who did not hesitate to predict that before very long the output of gas in Footscray would be nearly quadrupled. But without committing themselves to an estimate that might appear too sanguine, the Directors did look forward with confidence to a considerable expansion. Such expansion could not but favourably affect the revenue of the undertaking. But it was not to be secured without some further expenditure; and for raising the necessary additional capital, the Board appealed with confidence for the support of the shareholders. Of the 5000 additional shares which were offered for subscription early last year, rather more than 4000 had been taken up; and the Directors proposed as a first step to issue the remaining 900 or 1000. As soon as these had been disposed of, it was proposed to apply to the Stock Exchange for a quotation—a step which it was believed would enhance the value of the security. The Directors therefore invited from shareholders applications for these remaining shares, not only as offering an excellent and improving investment, but also to ensure the further development of the undertaking.

The Hon. Sir JOHN W. TAVERNER, K.C.M.G., seconded the motion, which was unanimously carried.

Moved by the CHAIRMAN, and seconded by Mr. F. R. SMITH, a final dividend of 3½ per cent. per annum, less income-tax, was declared.

The CHAIRMAN moved the re-election of the retiring members of the Board—Mr. S. E. Figgis (one of the local Directors) and Mr. F. R. Smith. He remarked that Mr. Smith was well known to the shareholders; and he was not the least valuable of the Directors. Mr. Figgis was not quite so well known. He was, as was stated in the report, the Engineer and Manager of the Ballarat Gas Company. He was in England last year for some considerable time; and the Directors had frequent opportunities of meeting him. They were very favourably impressed by his ability and business acumen; and it was a great pleasure to them to know that, after he returned to Melbourne, he was willing to act in conjunction with the Melbourne Board.

Mr. H. KING HILLIER seconded the motion, which was unanimously agreed to.

Mr. SMITH having returned thanks on behalf of himself and his Australian colleague,

The Auditors (Messrs. Wood, Drew, and Co.) were reappointed on the motion of Mr. J. T. MAITLAND, seconded by Mr. W. CHAFFER.

The CHAIRMAN said he had to ask the shareholders to, as usual, accord a hearty vote of thanks to the Melbourne Board, the Managing-Director, and the staff at both the works and the offices. On this occasion, he thought they had special reason for passing this vote, in view of the splendid services the Melbourne Board had rendered in connection with the acquisition of the two new undertakings.

Mr. A. CADDICK seconded the motion; and it was cordially agreed to.

Mr. W. RICHARDS moved a vote of thanks to the Chairman and Directors. He said that, even in these trying times, he was sure the interests of the shareholders were perfectly safe in the hands of the present Directors. He also suggested that the Directors should convey to Mr. Spencer the sympathy of the shareholders in the great anxiety through which he was passing.

Mr. H. F. HILLS seconded the motion, which was heartily carried.

The CHAIRMAN, having acknowledged the vote, said the Directors would certainly convey to Mr. Spencer the sympathies of the shareholders generally. It was a great disappointment to their Chairman not to be present at the meeting. In a letter to him (Mr. Hunt), he mentioned that he had not been absent for 25 years.

SOUTHAMPTON GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Wednesday—Captain A. J. Corse-Scott, J.P., in the chair.

The Secretary (Mr. J. R. H. Jacobs) submitted the minutes of the previous meeting and also the report of the Directors, which was noticed in the "Journal" a fortnight ago [p. 206]; and they were taken as read.

The Chairman, in moving the adoption of the report, said there were many holding a similar position to that which he filled that day who were afraid to face the shareholders at this time of the year, for though they might have earned a dividend, they had decided not to pay it. The shareholders of the Southampton Gas Company, however, were no doubt very pleased to see that the Directors had recommended the payment of the maximum dividends for the past half year; sufficient profit having been earned to enable this to be done, and also to add a small amount to the balance carried forward. The capital account showed that £7247 had been spent, mainly on account of the new retort-house and the rebuilding of the Coliseum; and £1289 was written-off for depreciation—making the net increase of capital £5958. In the revenue account the cost of the manufacture of gas showed an increase of just over £2000. The cost of coal and of oil was much higher than for the corresponding period of 1913; but that of carbonizing in the new retort-house had been considerably reduced owing to the improved working methods adopted. The other items on the expense side did not call for any particular comment. The income from the sale of gas had increased by very nearly £2000, which was itself a satisfactory feature. The net profit was £420 more than in the six months ended June, 1913. The new retort-house had been completed, and the improved returns in gas made per ton of coal, and the saving effected in working, fully justified the Directors in the steps they had taken in embarking on the large capital expenditure involved. He desired to mention that they were greatly indebted to the valuable assistance of one of the Directors (Mr. Joseph Cash), who had throughout the whole period the retort-house was building freely advised them; in fact, he had acted as though he were still the Consulting Engineer of the Company. It was hoped by his colleagues that the stockholders would show their appreciation of his services by voting an honorarium to him. Upwards of 65 of the Company's employees had been called up or had volunteered for active service. The Directors had promised to keep their positions open for them on their return; and in regard to married men the Company were making up the Government pay and allowances to the full amount of each man's wages. The Directors, in response to the appeal made by the Prince of Wales, had voted 300 guineas to his fund, and 25 guineas to the Red Cross fund. Measures had to be taken to guard the works of the Company; and he was pleased to say that practically the whole of the employees had voluntarily offered their services for this work. They had also agreed, so long as the war continued, to give weekly a portion of their earnings to the relief funds. In these matters the Secretary had rendered valuable assistance; and they were much indebted to him. In conclusion, the Chairman expressed the hope that the current half year would result profitably to the Company.

Mr. J. C. Moberly seconded the motion, and it was carried unanimously.

The maximum dividends were then declared, and an honorarium of 100 guineas was voted to Mr. Cash, in recognition of his services in connection with the erection of the new retort-house.

Mr. Cash, in acknowledging the vote, said that what he had done had been a labour of love.

Thanks were then accorded to the Directors, officials, and staff, and the proceedings closed.

NEWRY GAS-WORKS RESULTS.

In his annual report on the working of the Newry gas undertaking, Mr. Isaac Carr (the Consulting Engineer) states that the renewal of four beds of retorts was entrusted to Messrs. Drakes Limited, of Halifax, and will be completed in time for the heavy winter make. He enumerates several other improvements that have been made, and points out that, under the new Manager (Mr. P. B. Ellicott), the balance-sheet shows a credit balance of £128, against a debit balance last year of £776. Notwithstanding the increased cost of coal, and the large sum spent on distribution, the net cost of manufacture and distribution per 1000 feet of gas sold is 2d. below that of the previous year. The unaccounted-for gas has been largely reduced, and will probably in the current year reach a normal figure. The gas sold per ton of coal carbonized during the year was almost 2000 cubic feet in excess of the previous year. A great improvement has been effected in the yield of sulphate of ammonia per ton of coal.

The report of Messrs. Pickering and Co., accountants, of Belfast, shows a gross profit on the manufacture and sale of gas of £1819, as against £911 last year. The cost of renewal of gasholders is stated at £858, which is, however, not dealt with in the accounts; and the Gas Committee are recommended to have the amount distributed over a number of years, as a charge against revenue. To the credit of profit and loss is a total of £1824. From the figures supplied to the firm, it would appear that the gas made was 45,125,000 cubic feet; while the total sold and used in public lamps and on the works was 35,235,000 feet. An increase from 3s. 9d. to 4s. 2d. per 1000 cubic feet in the price of gas since July 1 last might, to some extent, account for the improved financial position; but the increased price of coal and other material might counterbalance the difference.

At a meeting of the Urban Council, Mr. R. Kerr expressed the opinion that the reports were satisfactory, and observed that the works had made more gas per ton of coal than at any time in the last seven years. Mr. H. J. M'Conville (the Chairman) said that all the improvements had been made on the recommendation of the expert. There was no use in going back on what had happened in the management of the works; but if they had now been made into a paying concern, the money laid out had been spent wisely and well.

COAL GAS: A CENTURY OF SERVICE.

This was the title of a very interesting and instructive lecture delivered at Sutton (Surrey) last Tuesday evening, by Mr. W. M. Mason, the Secretary of the British Commercial Gas Association. It was illustrated by a number of lantern views, and was listened to with great attention.

Introductory and Historical.

In introducing his subject, Mr. Mason said it was perhaps not too much to assert that the greatest revolution of modern times in domestic and social life had been brought about by the introduction of coal gas and its gradual appropriation to every-day use. Originally intended for lighting only, gas had now become a domestic necessity, not only as an illuminant, but also for cooking and heating, in the homes of rich and poor alike. Long since it gained complete victory over the tallow candle and the "crusie" lamp of our great grandfathers; and though for a time it seemed as if electricity would supersede it, the advent of high-pressure gas lighting, with its enormous illuminating brilliancy for a fractional cost, had completely reinstated it as the "leading light" for the artificial illumination of street, shop, or factory. The ordinary individual seldom gave thought to the vast expenditure of money, brain power, and human energy which lay behind such a simple act as the turning of a tap in a large city, and drawing therefrom a plentiful supply of water. The similar act of turning a gas-tap, and thereby securing a plentiful supply of illumination and clean fuel ready for use, and requiring only a light and a suitable appliance in which to consume it, should, he submitted, at least arouse interest, if it failed to appeal to the unimaginative.

Turning then to the source of gas—*i.e.*, coal—Mr. Mason referred to the conversion, by the wonderful processes of Nature, of prehistoric forests into indispensable constituents for carrying on the world's work; and he showed that not only did coal produce gas, but a great number of other products, a collection of which he had in a large case. This led him to tell the story of the discovery, by William Murdoch, of the applicability of gas for lighting purposes. By the aid of slides made from photographs taken in the Sutton Gas-Works, he described the process of making this illuminant, from the entrance of the coal into the works to the storage in the holder of the chief product of its distillation. In this connection, he took the opportunity of dispelling the alarm sometimes raised in newspapers in regard to the danger from explosions if gasholders were damaged by missiles dropped from airships, &c.; and he emphasized the point that such alarm is quite unwarranted, as pure gas will not explode. He referred to the fact that, amid all the horrors of the present war, there had not been the slightest hint of disaster from gasholders, though many of them must have been destroyed.

Gas in the Home.

The lecturer then literally brought his subject home to his audience by showing that there is no more faithful domestic servant than a good supply of ordinary coal gas, as it will cook, wash, clean, warm, and light. "Coal," said Mr. Mason, "means cellars or bunkers, dirt when it is brought in, and dirt when it is conveyed to the fire, sulphurous smoke and soot when it is burning, and ashes after it is consumed. Gas is bovrilized coal, with the dirt, smoke, tar, soot, and ash, besides the other impurities, left in the gas-works. It is fuel ready for use, brought not merely to your door but to your fireplace." He suggested that probably one of the many reasons to account for the popularity of gas, especially in suburban localities, was the fact that "it is one of the few commodities your neighbours cannot borrow."

Improved Light-Giving Value of Gas.

Mr. Mason showed how, for seventy years, gas had had a monopoly for the supply of artificial light; but early in the eighties it had to face a competitor in electricity. In spite, however, of its formidable rival, it had become the cheapest and most efficient lighting medium yet discovered for the service of the people. He showed some diagrams which gave a strikingly clear idea of the wonderful vitality of the gas industry. "Truly," he said, "one may pardonably observe that an industry which can present such a record of increasing usefulness at the end of a century's service may well claim to have emerged with credit from the crucial tests of time and utility, and is, moreover, fully entitled to something beyond passing notice from the public whom it serves." The facts really were that the competition of electricity had greatly stimulated the gas industry.

The lecturer next showed how lighting had been improved by the invention, by Baron Auer von Welsbach, the distinguished German scientist, of the incandescent mantle, the introduction of which, in conjunction with the bunsen burner, had, he said, been "not only the salvation of the gas industry, but the means of bringing within the reach of even our humblest citizens a safe, reliable, economical, and brilliant illuminant." He told his audience that, with inverted burners, suitable for all kinds of home and shop lighting, and gas at the Sutton price (2s. 6d. per 1000 cubic feet), a light equal to 20-candle power could be obtained for 30 hours at the cost of 1d.; and lights of higher power at equally low proportionate rates. With the cheap forms of incandescent burner fitted with ordinary upright mantles, it was easy to obtain anything from 15 to 20 candles per cubic foot of gas used. He showed a slide giving a good idea of the relative values of various systems of gas lighting, and remarked that now that householders, shopkeepers, and others were recognizing the value and utility of the incandescent system, which gave from six to twenty times the illuminating value compared with the old style of open burner lighting, there need be little wonder if the quantity of gas used per consumer for lighting purposes was greatly reduced.

Domestic Uses of Gas.

After a few remarks on shop and factory lighting, and a reference to the testimony borne by the medical profession to the advantages of gas over other light-giving agents so far as eyesight is concerned, the lecturer proceeded to direct the attention of his audience to the various domestic uses of gas. Dealing first with culinary operations, he pointed out that it has taken more than sixty years to bring cooking by

gas into general use; and there are still people who are prejudiced against it, forgetting that gaseous fuel is one of the purest combustibles they can use. In all large and well-appointed kitchens gas is almost universally employed for cooking. Most ladies were aware of the great boon gas-stoves had proved to be, not only for the every-day culinary requirements of the household, but also for the rapidity and ease with which special and tempting dishes could be prepared and cooked for any sudden emergency. In hot weather, a gas-cooker was an undisguised blessing.

The lecturer next turned to gas-fires, and emphasized the comfort they brought to a good housewife when they were properly fitted in a house, and had the small, but requisite, amount of attention given to them. He acknowledged that, for a fire in continuous use, reckoning only the cost of the fuel, gas was not so cheap as coal; but when the labour attached to a coal-fire was taken into account, the extra time taken for dusting, the wear and tear of the carpets, the cleaning of curtains and linen, and many other items, the balance of saving was well on the side of the gas-fire. The lecturer quoted the testimony of medical men in favour of these fires. The complaint that used to be commonly made with regard to the dryness of the air resulting from the use of gaseous fuel had, he said, been met and overcome. Heating by radiation was more pleasant and healthful than heating by convection. Mr. Mason closed this portion of his lecture by assuring his audience that a year's experience with good gas-fires, properly fitted and attended to, would do more to convert economical and cleanly housekeepers to the full use of gas as a heating agent than all the figures he could put before them. He then explained the fires, burner, tap, &c.

Gas water-heating appliances were next considered. The lecturer described the three types available—*i. e.*, the small boiler connected to a tank, which can be used independently or in conjunction with existing arrangements; a boiler and storage-tank combined in one appliance, with burner underneath; and geysers, or instantaneous water-heaters, not usually connected to pipes or taps, but drawn upon direct. He indicated the many advantages secured by the introduction of gas water-heaters, and then turned to radiators, wash-boilers, &c. He pointed out that the former could be easily installed, and were a great saving over the old, unsightly, and elaborate system of heating by steam-pipes. The compact gas-heated wash-boiler took up little space, and ensured the minimum of work for a disagreeable job. Gas smoothing-irons were now so generally used that he need scarcely do more than refer to them. Thrifty housekeepers who did their own laundry work fully appreciated the convenience and economy of the gas-iron.

In conclusion, the lecturer strongly advised his audience to watch their meters and check their gas consumption, as this was the most effective means of preventing waste.

[By way of illustration, Mr. Mason had an exhibition of old gas-burners, and contrasted them with modern methods of lighting. He also had a good display of gas appliances, including water circulators and models. These added considerably to the educational value of the lecture, which was well attended.]

GAS v. ELECTRICITY FOR WORKHOUSE LIGHTING.

Triumph for Gas at Newmarket.—Gas v. Electricity for Cooking.

The Newmarket Board of Guardians, at their meeting last Tuesday, settled the question of the lighting of the workhouse, which has for some time been under consideration. Tenders had been received by the Workhouse Committee for electric lighting; but they decided to recommend that this system should not be adopted, but that the Master should be instructed to obtain estimates for an installation of incandescent gas-burners at a cost not exceeding £20. Electricity was offered at 4d. and 2d. per unit; the price of gas being 3s. 6d. per 1000 cubic feet.

Mr. WHEELER, in moving a resolution to the above effect, said the Committee had given a great deal of time to the lighting question. They felt it was an important one, because they spent more than £100 a year on lighting; and if any system could be introduced by which they could light the workhouse at a lower figure, they ought to introduce it. The Board had, some weeks previously, accepted a recommendation not to introduce air gas. The Committee then considered the question of the introduction of electric light, but inasmuch as it would mean an outlay of between £300 and £400, and the advantage to be gained was at least doubtful, the Committee felt that they could not recommend the expenditure. They had, of course, to remember that they had gas-fittings that were purchased at a cost of something between £200 and £300, and these would be useless if they introduced electric light. They felt, therefore, that they could do no other than recommend that the electric light be not installed, and that, as far as possible, they should introduce incandescent gas-burners into the house. This, they thought, would certainly effect some saving, and was the best possible course to take at the present time.

The CHAIRMAN (Mr. F. N. Bocock, J.P.) seconded the motion.

Mr. PLAYFORD remarked that, as Mr. Wheeler had said, the Committee had spent a good deal of time on this question of lighting; and he ventured to say that it had not been wasted, and that the Committee and the Board had learned certain things which would be of use to them in the future. The Committee thought it was necessary to retain gas for various appliances—such as gas-rings, &c.—in the house, and they could not recommend the Board to go to the extra expense of alterations to pipes and so on to retain these. But he ventured to say that it was not necessary to retain these appliances when the efficiency of electricity for cooking and heating was so much greater than that of gas. One could no more compare the efficiency of electricity and gas than one could compare coal and gas. The coal merchant might say that the heat generated by the combustion of 1d. worth of coal was equal to 7d. worth of gas. The gas people would not admit this; but it was equally as correct as their own statement as to the cost of gas compared with electricity. The British thermal units of heat obtained from 1d. worth

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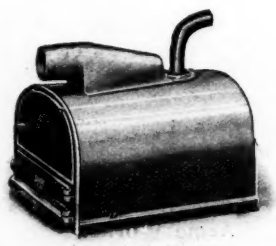

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of each—gas and electricity—for cooking or heating, taking them both at 100 per cent. efficiency, was 16,666 for gas and 3411 for electricity. This was in theory. But when they put it into practice, they found that electricity had an 80 per cent. efficiency, while that of gas was 15 per cent. This brought them pretty close together. The useful British thermal units were 2730 for an electric stove and 2500 for a gas-stove. For an electric kettle the efficiency was as great as 97 per cent.; and his put electricity on top. When the public and the Board realized, as no doubt they would, that electricity was making great advances, and electric apparatus was constantly improving, they would, before long, have this matter before them again. He had no doubt that some of their farmer and butcher friends would repudiate the statement, but it was a fact that if 6 lbs. 13 oz. of meat were cooked in an electric oven one could put practically 6 lbs. of meat on the table; whereas if 8 lbs. 9 oz. of meat were cooked by gas only 6 lbs. went to the table. The saving in weight with electricity was 1 lb. 12 oz., which, at 10d. per pound, meant a saving to the consumer of 1s. 5½d. on the joint. Though the Board might not go through with an electric installation now, the time would come when the matter would have to be considered again.

The CHAIRMAN said the Committee had been nearly a year considering the question of lighting; and, as Mr. Playford truly remarked, they had learned something. But Mr. Playford had still to convince him (he spoke both as a butcher and a farmer) as regarded the merits of an electric oven.

The Committee's recommendation was adopted.

REDUCED STREET LIGHTING IN LONDON.

At a Meeting of the Battersea and Clapham Junction Traders' Association on Friday, discussion took place on the question of street lighting outside tradesmen's premises.

Mr. A. E. STOKES (of the South Metropolitan Gas Company) said from the Company's point of view the order for the reduction of outside lights was a big matter, and could not be decided upon in short time. With regard to the high-pressure outside lamps, the Company could not charge the traders for gas which they did not consume, though they had signed a contract. Then there was the question of maintenance. If they wanted these lamps kept in proper condition, so that they could be lighted as soon as the order for the reduction of light was rescinded, it was quite clear that the lamps should be kept clean. In a very short time they might receive an intimation that they could resume the outside lighting, at any rate in a modified form. The Company had spent a large sum of money in capital outlay; and a certain amount was put by every year for this. It was the idea of the Company to ask their consumers to pay a proportion of the ordinary maintenance—say, from 25 to 50 per cent.

Mr. J. ASTILL remarked that he was very gratified with what Mr. Stokes had told them, and thought the Company had treated them in a fair, honourable, and businesslike way. He proposed a vote of thanks to Mr. Stokes.

Mr. W. ROCKE, who seconded, said he was quite satisfied.

The resolution was carried; and it was unanimously decided that the high-pressure lamps should be kept in good condition.

Mr. ASTILL said traders had received very different treatment from the Battersea Borough Council. As yet they had not decided what they were going to do; and he suggested that they should write to the Council on behalf of those who had signed electric light contracts, asking what they intended to do.

Mr. HUMBEST, who seconded, pointed out that consumers of electric light had to pay in advance.

Mr. ASTILL characterized this as very sharp practice. He said it demonstrated the difference between a well-managed concern and one managed by gentlemen very few of whom knew anything about the matter.

It was decided to send a letter to the Borough Council on the lines suggested by Mr. Astill.

At a meeting of the Wandsworth Borough Council, Mr. W. J. Renshaw proposed—"That, in the opinion of this Council, the excessive diminution of street and shop lighting now being enforced in the Metropolis is a serious danger to traffic, unless intended to prevent air-ship raids, and is causing considerable loss to traders and to entertainment providing industries. This Council, therefore, begs His Majesty's Government to give consideration to the resumption of normal street and shop lighting at the earliest possible moment."

Mr. G. F. DOLAND complained bitterly that the tradesmen's interests were neglected by the Home Office and the Chief of Police.

The motion was lost by 12 votes to 24.

A large number of tradesmen and stallholders in the Tower Bridge Road have presented a petition to the Bermondsey Borough Council pointing out that, owing to the lowering of the lights, trade had considerably fallen off, and praying that the time-limit for Sunday morning trading should be extended from 11 o'clock until 1.30. The Council, however, decided to take no action.

Municipal Gas Supply of Pavia.—A recent number of "Elettricità" contained some particulars in regard to the gas supply of Pavia last year. The profit amounted to 59,940 lire (1 lira = 9½d.), or 6886 lire less than for 1912, owing to the competition of electric lighting. The total receipts showed a total decrease of 17,160 lire; the greatest differences being in the smaller quantity of gas and residual products sold. The expenses amounted to 578,067 lire, compared with 585,342 lire—a drop of 7275 lire. There was a reduction in the unaccounted-for gas from 19·57 to 18·14 per cent. The figure is still very high; but that it is becoming less is a cause for satisfaction.

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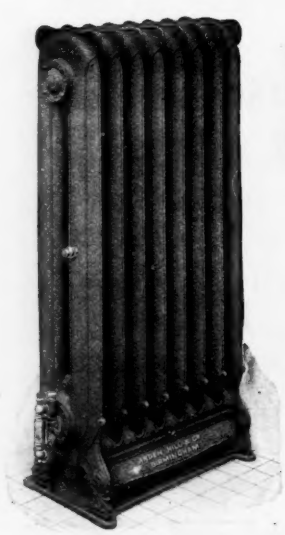

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NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

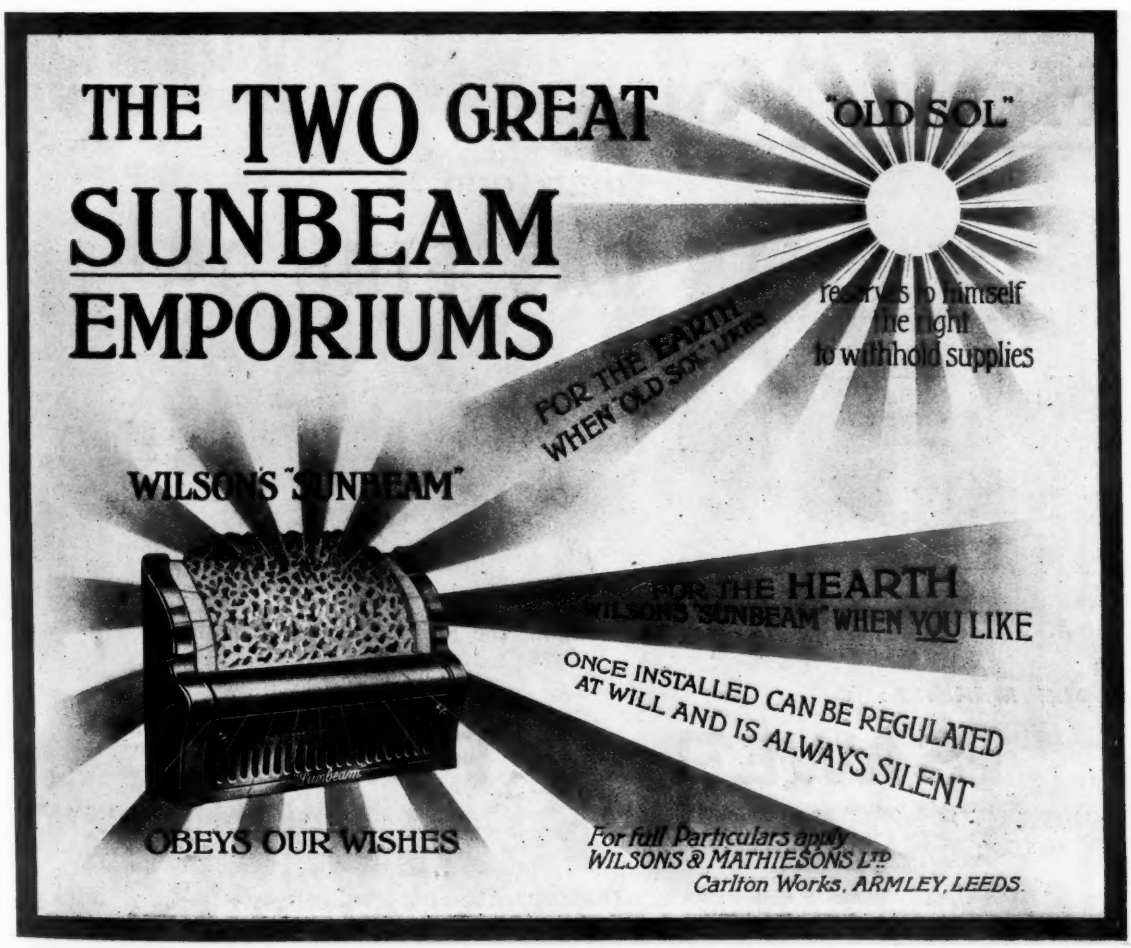
In retiring from office in the Town Council of Airdrie, Provost John Orr, who has been a member for fourteen years, gave the ratepayers an interesting review of the municipal progress made during this time, and particularly referred to the leading part he took in municipalizing the gas supply of the town and district. About eleven years ago, he said, the question arose in the Town Council as to the desirability of acquiring the gas undertaking. He was one of the leading advocates for the purchase. The old Gas Company were about to extend their works on a large scale; and he felt that the time had come when, in the interests of the consumers and the ratepayers generally, the town should acquire the concern. He had never regretted giving this advice. The purchase having been effected, he was appointed the first Convener of the Gas Committee, and endeavoured to acquire what, to a novice, was a somewhat elementary knowledge of gas manufacture. But he was more concerned then, and since, with the financial aspect of the undertaking, in order to ensure that the ratepayers should get the full benefit of the purchase. Despite the occasional criticism of the management and finances, the undertaking was still one of the best investments, if not the very best investment, that the ratepayers of Airdrie ever went in for. If they had allowed the late shareholders to proceed with their contemplated extensions, and to spend the money that had now been spent on these additions, it would have no doubt been even better for the shareholders; for when the time of purchase did arrive after they had incurred these outlays, they would have made a much finer thing out of it. By acquiring the works when they did, the Corporation saved for the burgh a sum of at least £20,000. The success of the undertaking had been almost phenomenal. The gas manufactured last year amounted to 119,550,000 cubic feet, which was nearly double the output of ten years ago. The works had been almost entirely remodelled, and fitted up with the most modern appliances. What was better still, the price of gas had been substantially reduced. He was interested the other day in comparing the price of gas charged by corporations very similar to Airdrie. One of them took over the gas-works a few years before Airdrie, and the other two or three years after Airdrie had done so. He referred to Falkirk and Kirkcaldy respectively. In Falkirk, the price to ordinary consumers was 3s. 3d., and in Kirkcaldy 3s. 4d. per 1000 cubic feet. In Airdrie the price was 2s. 7d., or 20 per cent. less. Then, again, in Falkirk the price to slot-meter consumers was 3s. 5d., and in Kirkcaldy it was 3s. 10d. In Airdrie, the charge to slot-meter users was 3s., as against the 4s. 2d. of the old Airdrie Gas Company at the time the undertaking was taken over by the burgh. Bailie Goldie, the new Gas Convener, and those associated with him, together with the Gas Engineer (Mr. Dugald Currie), were to be congratulated on more than maintaining the success of the early years of the undertaking.

At a recent meeting of the Airdrie Town Council, a recommendation by the Gas Committee that the testing of the gas by the Public Analyst should not be resumed, as it served no useful purpose, was under discussion. The tests were being made periodically in accordance with sections 29 to 32 of the Airdrie Gas Order (Confirmation) Act, 1904, and a letter was read from Messrs. R. R. Tatlock and Thomson, of Glasgow, giving an explanation as to why they had discontinued making the tests. Treasurer M'Allister dissented from the Committee's recommendation. Bailie Goldie, the Convener of the Committee, said they considered that no good purpose was being served in testing the gas, because its principal qualities were now calorific and not illuminating. They had, of course, the testing plant installed at the works, and, if the Council thought it wise, they might appoint a small Committee to go and see the tests made by themselves; but there was no need to waste the money (about eight guineas a year) on an expert's test. Councillor Reid, who had previously brought the matter before the Council, said there were two parties to consider—the consumer as well as the Committee. The consumer was entitled to see that he had a good article for his money. It might, however, be wrong to saddle the Committee with the cost of the test, as he thought the consumer should bear it; and he would agree that, in future, the Fire and Lighting Committee, who had charge of the street lighting, &c., should be debited with the testers' fees. Treasurer M'Allister agreed with this suggestion. The consumers were, he said, entitled to have reports made on the quality of the gas they used. Eventually, by a majority of one, it was decided to continue the tests, and to debit the cost to the Fire and Lighting Committee.

Efforts are being made, as a result of the proposed extension of the gas supply from Perth to Almondbank, to have the gas carried to Methven. With this object in view, a deputation has been appointed from the Methven Parish Council, and it is probable that the Perth Town Council will accede to the request, as the cost of conveying gas to the village will be considerably lessened in view of the extension to Almondbank. At present Methven is supplied with gas at the price of 10s. per 1000 cubic feet; and the Perth Council feel that they can carry out the extension and sell gas at a much cheaper rate, as well as bring a considerable revenue to the city.

The Dalbeattie Town Council met yesterday, when the question of the water supply was once more considered; and it was finally agreed to open the pit on the south side of Buittle Hill. This is the spring from which it is estimated that a supply of 10,000 gallons per hour can be obtained. The Burgh Surveyor was entrusted with the supervision of the work, and instructed to make a start as soon as possible.

Extensions at the Chorley Gas-Works.—At the last meeting of the Chorley Town Council, the Town Clerk reported that the formal sanction of the Local Government Board had been received to the borrowing of £18,750 for the installation of vertical retorts and a new condenser.



London Address: 76, Queen Street, Cheapside, E.C.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Nov.* 9.

There is little business being done in tar products generally. Pitch is quiet; and the price to-day cannot be called higher than 32s. per ton net at makers' works. Toluol and crude carbolic acid continue in good demand; and there are one or two large inquiries in the market for benzol which should have a stiffening effect on that article.

Sulphate of ammonia is in fair request, and makers' price remains unchanged at £10 17s. 6d. per ton net at makers' works for 25 per cent. quality.

Tar Products in the Provinces.

Nov. 9.

The markets for tar products keep fairly steady, and in some products there has been a decided improvement. Ninety per cent. benzol is quiet, and lower prices have been accepted in one or two quarters. Toluol is exceedingly firm, and good figures have been paid for delivery up to June next. Solvent naphtha is quiet, and some reasonable prices have recently been accepted. Heavy naphtha is steady, and there is a fair amount of inquiry. Creosote is firm in all quarters. The inquiry for crude carbolic is regular, and makers are generally firm in their idea of value.

The average values during the past week were: Value of liquid products in one ton of tar, 16s. 6d. to 18s. Benzol, 90 per cent., naked, North, 8½d. to 9d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 1s. 9d. to 1s. 10d. Crude naphtha, in bulk, North, 5½d. to 5¾d. Solvent naphtha, naked, North, 8½d. to 9d. Heavy naphtha, naked, North, 11d. to 1s. Creosote, in bulk, North, 3⅜d. to 3 1/16d. Heavy oils, in bulk, 4d. to 4½d. Carbolic acid, casks included, 60 per cent., East and West Coasts, 2s. 6d. Naphthalene, £4 10s. to £10; salts, 60s. to 65s., bags included. Anthracene, "A" quality, 1½d. to 2d.; "B" nominally ¾d.

Sulphate of Ammonia.

LIVERPOOL, *Nov.* 7.

During the past week there has been little alteration in the market for this article; but the tendency of prices has been to recede slightly, owing to the paucity of fresh orders which have been placed, and the postponing and cancelling of shipments to the United States against contracts made some time ago. The nearest prompt values are now £10 15s. per ton f.o.b. Hull; £10 16s. 3d. per ton f.o.b. Liverpool, and £10 17s. 6d. per ton f.o.b. Leith. Some manufacturers are reported to have modified their views in the forward position, and it has transpired that first-hand business has been done at £11 2s. 6d. per ton f.o.b. good port, for delivery during the first half of next year.

Nitrate of Soda.

The tone of this market is weaker on spot, and quotations have been reduced to 9s. 9d. per cwt. for ordinary quality, and 10s. 3d. for refined.

Sulphate of Ammonia.

From another source it is reported that the market for this article has been decidedly dull during the past week, and prices have again lowered to the extent of about 2s. 6d. per ton. At Hull, the quotation is £10 12s. 6d. to £10 15s.; Liverpool, £10 15s. to £10 17s. 6d.; Leith, £10 17s. 6d.; Middlesbrough, £10 15s.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is quieter, because steamers are scarce at the coal-loading ports, and the rates of freight are higher. In the steam coal trade, best Northumbrians are easy at 13s. to 13s. 1½d. per ton f.o.b. Second-class steams are duller at 10s. 9d. to 11s. per ton; and steam smalls are 7s. 6d. to 9s. 3d. per ton f.o.b.—the latter kinds being scarce owing to the output at some of the collieries being reduced. In the gas coal trade, the demand for home use improves, and there are fair exports for countries such as France, Italy, and Sweden, though delivery of coals is not so rapid from steamers as could be desired. Best Durham gas coals are steady at about 12s. 6d. per ton f.o.b.; and second-class gas coals are quiet at 11s. 6d., and at the moment plentiful. "Wear Specials" are fairly firm at about 12s 9d. to 13s. per ton f.o.b. The effect of the extension of the war to Turkey will be very slight as far as coals are concerned. But it is influencing the rate of freights to many of the Mediterranean ports; and thus it increases the delivered cost of the coal. It is probable that in a week or so these freights may be adjusted to the altered circumstances; and possibly the use of very large steamers may cheapen the cost of coal-carriage to London. The coke market is fairly steady, and exports are a little heavier from the Tyne. Good gas coke is from 11s. 9d. to 12s. 3d. per ton f.o.b.

Kirkby Gas Loan.—It was reported at the last meeting of the Kirkby (Notts) District Council that the Local Government Board had requested to be furnished with the reason for the large excess of the amount of the tender over the estimate for the erection of a new gasholder. The Clerk was instructed to reply that the excess was accounted for by the extra depth of excavation work required, and the increased cost of material owing to the war; while regarding certain items the prices had been under-estimated. The Council decided to apply for permission to borrow an additional £1500, making the total loan £5500.

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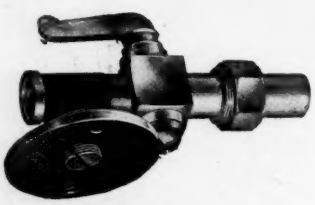
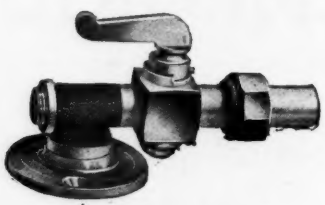


USED AS STRAIGHT-WAY TAP.



USED AS ELBOW TAP.

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Agent for Scotland: JNO. D. GIBSON, 2, Causeyside Street, PAISLEY.

Boston Water Supply.

Serious differences have arisen between the Boston Town Council and the Water Company regarding the alleged altogether unsatisfactory nature of the supply to the town; the matter, which has formed the subject of protracted correspondence and discussion, resulting in the intervention of the Local Government Board, who deputed an Inspector on Friday to inquire into the affair. His report is awaited with considerable interest; the criticism which has been forthcoming as to the quality of some of the water having been of a very stringent character. The Medical Officer had caused samples to be taken from the Mount Pleasant Drain at a point from which it was proposed to pump water; and these have been submitted to the Clinical Research Association for analysis—the inhabitants being meanwhile warned against drinking the water from this source. The report received from Mr. C. H. Wells (Director of the Association), which was presented at a recent meeting of the Sanitary Committee, stated that the results of the analysis indicated considerable recent pollution of the water submitted, and that it could not be regarded as satisfactory new water for a public supply. In this condition of affairs, the Sanitary Committee urged that there should be an ample supply forthcoming from Willoughby, another source in relation to which no suggestion of impurity obtains. The refusal of the Directors of the Company to receive a further deputation from the Council has given rise to a somewhat acrimonious feeling.

Accident at the Northampton Gas-Works.—At an inquiry into the death of Charles Cumberpatch, a shunter at the Northampton Gas-Works, it was stated that deceased was going to unhook a coal-waggon, when he slipped on some coke and fell under the waggon, a wheel of which passed over him. He was accustomed to get off the engine to turn the points; and on the occasion of the accident there was a clear space where he got off, though some coke was along the line. The Jury returned a verdict of "Accidental death;" and sympathy was expressed on all sides with the widow and relatives.

A Coal-Tar Plant for Southport.—At this month's meeting of the Southport Town Council, the Gas Committee will recommend that the tender of the Chemical Engineering Company and Wilton's Patent Furnace Company for a coal-tar installation, for the sum of £2672, be accepted. This is a reminder of further improvements which are in contemplation for the Southport Gas Estate at Crowlands. Alderman Trounson (the ex-Chairman of the Gas Committee) recently announced that important experiments were to be conducted at Southport with regard to aniline dyes and the attempt to capture part of this trade from Germany for British manufacturers; and it would appear that there is some association between this announcement and the recommendation of the Gas Committee. The excavation work, &c., in connection with the same development is estimated to cost £231. Mr. John Bond (the Gas Engineer) has already reported to the Committee on the question of introducing a coal-tar plant; while it has also been decided to instal, at a cost of £75, apparatus to manufacture household ammonia.

Stoke-on-Trent Gas-Works Management.

With reference to the new arrangements in connection with the management of the Stoke-on-Trent Council's gas undertakings, the "Staffordshire Sentinel" says that the September meeting of the Council "was so overshadowed by the war that not much attention was paid to it. Yet it was a noteworthy meeting, for Mr. Langford, for many years the Manager of the Longton Gas-Works, was at length appointed Manager of the Corporation's four gas undertakings in Burslem, Stoke, Fenton, and Longton, with Mr. Surtees as Deputy Gas Manager, thus achieving the policy for which the Gas Committee, with Alderman Mitchell at their head, had all along contended, notwithstanding objections in detail which had been put forward by Alderman Geen. It was originally proposed that Mr. Langford's salary should be £700; but it was fixed at £600, rising by annual instalments of £50 to £700. And so the matter was settled. The Gas Committee acted wisely and with great foresight in taking advantage of the death of Mr. Jones at Burslem, and the retirement of Mr. Prince at Stoke, to amalgamate the management of the four undertakings; and in Mr. Langford the county borough have a Chief Gas Engineer and Manager whose judgment is sound, whose attention to duty is proverbial, and who stands as high in his particular calling as anybody in the country. Alderman Mitchell and the Gas Committee, and the Council and the public, may be congratulated on the new arrangement. Mr. Prince, who left the Stoke works with a retiring allowance under the Federation Act, went straight to a new appointment at Tipton; but this does not militate against the desirability of the joint management, and it appears that Mr. Prince's retiring allowance will, by arrangement, be a charge, not upon the rates of the county borough, which would ordinarily be the case, but upon the Gas Committee's finances."

Reduction in Price of Gas at Boston.—In announcing a reduction in the price of gas, the Boston (Lincs.) Gas Company state that after the next collection, the charge to consumers will be 3s. 7d. per 1000 cubic feet, with a discount of 10d. per 1000 cubic feet to all consumers paying their accounts during the month in which they are delivered, thereby reducing the price to 2s. 9d. per 1000 cubic feet net.

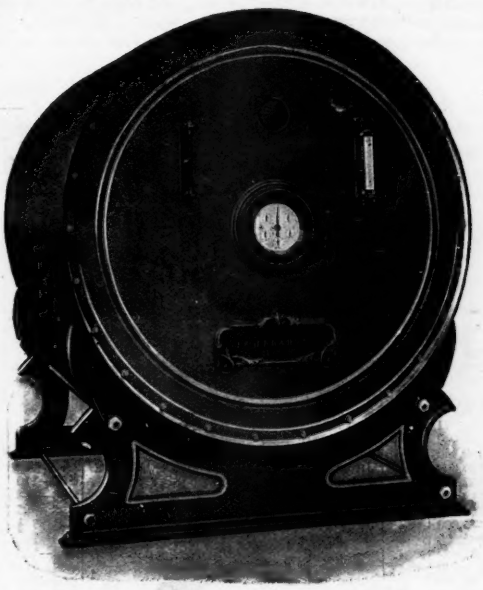
The New Verticals for Stafford.—On the minutes of the Stafford Gas and Electricity Committee coming up for confirmation at the last meeting of the Council, Alderman Westhead (the Chairman of the Committee) reported the receipt of a communication from the Local Government Board, stating that a local inquiry would be held as soon as possible in reference to their application for sanction to borrow £20,000 for the provision of vertical retorts. He also said that, following correspondence with the Local Government Board, it had been decided to withdraw from the application certain additional lands proposed to be bought for gas-works purposes, as this would render it necessary to apply specially for powers, and cause delay in connection with the scheme. The land already purchased would be sufficient for the purpose of the undertaking for many years to come.

BRADDOCK'S IMPROVED GAS METERS

No. 219. Braddock's Large Dry Meter.

SECOND TO NONE.

Made in all Sizes.



No. 245. Braddock's Large Wet Meter.

J. & J. BRADDOCK (BRANCH OF METERS LIMITED), **Globe Meter Works, OLDHAM,**

Telegrams: "BRADDOCK, OLDHAM." National Telephone No. 815.

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Telegrams: "METRIQUE, LONDON." Telephone No. 2412 HOP.

Future of London's Electricity Supply.

At the meeting of the London County Council to-day, they will have before them a motion to consider and decide whether or not they will promote next session a Bill dealing with the establishment of a new electricity undertaking for the County of London and certain adjoining districts, and also to determine the fund which is to bear the cost of such promotion. On the same occasion the Local Government Board and Museums Committee will present a report dealing with the local government aspects of the scheme under the following heads: (1) The commingling of the County of London with a large outside area; (2) the creation of an *ad hoc* authority for the purpose of administering one service only; (3) the introduction of company ownership in connection with the administration of the service. The question has been raised as to meeting any deficiency which might arise on the working of the undertaking; and the Committee are of opinion that, in the apportionment of it, assessable value would be an equitable basis to adopt.

Sale of Redhill Gas Stock.—In response to the invitation of the Directors of the Redhill Gas Company (as recently advertised in our columns), for tenders for £3500 of ordinary "B" stock, a total amount of £6820 was applied for. The stock was allotted at an average price of £101 3s. 7d. per £100.

Lighting of Wokingham.—At Wokingham, a recommendation by the Lighting Committee that for the present each alternate street-lamp, with the exception of those in main thoroughfares, should remain unlighted, was not accepted by the Town Council, who decided that, instead of reducing the number of lamps, they should be put out at an earlier hour. The Gas Committee's tender of £2 5s. per lamp per annum for lights burning from sunset to midnight, and of £4 10s. for lamps burning from sunset to dawn, was accepted.

Gas-Works Fire at Leeds.—A fire broke out last Thursday afternoon at the Meadow Lane Gas-Works of the Leeds Corporation, owing, it is surmised, to a naked light coming in contact with some gas, while workmen were engaged in carrying out alterations. The governor-house and another building adjoining which is used for the high-pressure plant were attacked by the flames, and four workmen were burned—only one of them, however, sufficiently badly to be detained at the infirmary, to which they were all promptly conveyed. The gas was cut off with all speed; and the brigade succeeded in keeping the flames from the purifier-house near by.

A Gas Inquiry Refused.—A request by the Kilrush (co. Clare) Urban District Council for a sworn inquiry into the general management of the gas-works, and into alleged irregularities dealt with in the Auditors' report, has been refused by the Irish Local Government Board. One of the members of the Council described the gas-works as a "wretched concern," and several others urged that the request should be renewed on the basis of specific charges.

The Late Oldbury Gas Manager.—At a meeting of the Oldbury District Council on Friday, the Gas Committee reported with regret the death of the late Manager, Mr. Adam Cooke, and recorded their appreciation of the valuable services rendered by him during the time he had charge of the works. The Clerk read a letter from Mrs. Cooke thanking the members and officers for the flowers sent at the funeral of her late husband, and also for the expressions of sympathy forwarded to her from time to time.

West Bromwich Gas Undertaking.—The West Bromwich Borough Treasurer (Mr. H. Kirk), in his annual abstract of accounts of the Corporation for the past year, dealing with the gas undertaking, states that the income of the department on revenue account was £62,443, and the expenditure £52,250, leaving a gross profit of £10,193. After charging £5703 for sinking fund and £3252 for interest, a net profit of £1238 remained for appropriation. The capital expenditure account was increased by £14,664 during the year; the total now being £255,999. The loan debit outstanding was £129,207, towards which there was £26,335 in the redemption fund.

Turning the Tables at Hollinwood.—In past years the residents of Hollinwood, near Oldham, have made frequent complaints to the local authorities about alleged offensive smells emanating from the gas-works; but the existence of such a nuisance has always been denied by Mr. Tim Duxbury (the Engineer) and his staff at Hollinwood. It now appears that at the last meeting of the Oldham Gas Committee, the General Manager (Mr. Arthur Andrew) reported that he had been in correspondence with the Clerk of the Failsworth District Council respecting the nuisance caused near the gas-works by an offensive smell (due, it is alleged, to a local rubber-works), of which the employees at the gas-works complained. The intermittent smell was, in his opinion, much worse than ever was the nuisance complained of by Hollinwood people as being due to the water-gas plant. The Gas Committee instructed Mr. Andrew to press the complaint vigorously.

GAS COMPANIES IN THE STOCK EXCHANGE.

Last week was a disappointment so far as regards progress towards smoothing-out or cutting the obstacles which impede the resumption of "business as usual" on the Stock Exchange. This is all the more vexatious, as it was a week of hard work for the Committee; and no good has come of it all. One might almost say that their efforts had rather a detrimental result, were it not that it is often profitable in the long run to learn from one's own initial failures. The upset proceeded from the emergency rules issued by the Committee on Tuesday in order to effect the desired extension of the advantages of the Government scheme to the clients of members and other parties concerned. These rules immediately encountered sharp criticism from a very considerable number of interested parties, who regard them with the utmost dismay, and who are forcibly bringing their arguments to the notice of the Committee. And this matter continued for all the rest of the week to engross attention. It is to be hoped that an adjustment may be reached at an early date. Business in the open market has been as quiet as ever, and practically devoid of feature. As regards gas stock values, another indication of public opinion was afforded by the tenders sent in to the Croydon Gas Company for an issue of £10,000 of 5 per cent. maximum stock. Applications totalled £27,720, at prices ranging from par to 10 per cent. premium, and the average price obtained was £102 2s. per £100 stock, or a fraction under £4 18s. per cent. for money. The Monte Video Company announce an interim dividend of 6s. per share, less tax. The Money Market increases in ease. The new issue of 15 millions of six months Treasury Bills was largely over-applied for, and was taken at a rate lower by 16d. per cent. than the previous issue a fortnight ago.

Bank Rate (fixed Aug. 8), 5 per cent.; last year, 5 per cent.

OFFICIAL QUOTATIONS AT THE CLOSE OF THE STOCK EXCHANGE ON JULY 30.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59—64	..	3 18 2
374,000	,,	July 10	4	Do. 4 p.c. Deb.	76—79	..	5 1 3
280,000	5	April 29	7½	Bombay, Ltd.	5¼—6¾	..	5 17 8
50,000	10	Feb. 26	16	Bourne-mouth Gas & Water — 10 p.c.	29—30	..	5 6 8
373,480	10	,,	7	Bourne-mouth Gas & Water — B 7 p.c.	15—15½	..	4 10 4
95,000	10	,,	6	Bourne-mouth Gas & Water — Pref. 6 p.c.	13¾—14	..	4 5 9
380,000	Stk.	Feb. 26	14	Brentford Consolidated	261—266	..	5 5 3
330,000	,,	,,	11	Do. New	204—209	..	5 5 3
50,000	,,	,,	6	Do. 5 p.c. Pref.	109—111	..	4 10 1
206,250	,,	June 11	4	Do. 4 p.c. Deb.	91—98	..	4 6 0
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208—213	..	5 3 4
244,200	,,	,,	8	Do. A Ord. Stk.	154—159	..	5 0 8
530,000	20	Mar. 26	12½	British	44—45	..	5 11 1
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88—90	..	4 8 11
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85—87	..	4 12 0
100,000	10	—	—	Cape Town & Dis., Ltd.	1¼—2½	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	4—6	..	—
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70—75	..	6 0 0
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord.	104—110	..	4 10 11
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106—108	..	5 1 2
560,000	,,	,,	5½	Do. 3½ p.c. do.	103—105	..	5 1 6
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	69½—71½	..	4 3 11
800 000	Stk.	,,	4	Continental Union, Ltd.	76—79	..	5 1 3
200 000	,,	,,	7	Do. 7 p.c. Pref.	115—118	..	5 18 8
492,270	Stk.	—	6	Derby Con. Stk.	123—125	..	4 16 0
55,000	,,	—	4	Do. Deb. Stk.	102—104	..	3 16 11
1,002,180	10	July 29	10	European, Ltd.	17½—18*	..	5 11 1
16,364,910	Stk.	Feb. 12	4/17/4	Gas Light and Coke — 4 p.c. Ord.	98—102	..	4 15 6
2,600,000	,,	,,	3½	Gas Light and Coke — 3½ p.c. max.	76—79	..	4 8 7
4,062,235	,,	,,	4	Gas Light and Coke — 4 p.c. Con. Pref.	96—99	..	4 0 10
4,674,850	,,	June 11	3	Gas Light and Coke — 3 p.c. Con. Deb.	72½—74½	..	4 0 6
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87—89	..	5 12 4
70,000	10	April 29	11	Hongkong & China, Ltd.	16¼—16¾	..	6 11 4
131,000	Stk.	Mar. 12	7½†	Ilford A and C	151—154	..	5 2 4
65,780	,,	,,	6½†	Do. B	115—118	..	5 8 0
65,500	,,	June 26	4	Do. 4 p.c. Deb.	92—94	..	4 5 1
4,940,000	Stk.	May 14	9	Imperial Continental	150—160	..	5 12 6
1,235,000	Stk.	Feb. 12	8½	Do. 3½ p.c. Deb. Red.	84—86	..	4 1 5
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c.	119—121	..	5 7 6
561,000	Stk.	Feb. 26	10	Liverpool United A	211—213	..	4 18 11
718,100	,,	,,	7	Do. B	146—148	..	4 14 7
806,083	,,	June 26	4	Do. Deb. Stk.	97—99	..	4 0 10

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
75,000	5	June 11	6	Malta & Mediterranean	4½—4¾	..	6 9 9
250,000	100	April 1	4½	Met. of Melbourne — 4½ p.c. Deb.	99—101	..	4 9 1
541,920	20	May 28	4	Monte Video, Ltd.	11½—12	..	6 13 4
1,775,892	Stk.	July 29	4½	Newc'tle&G'tesh'd Con.	9c½—99½	..	4 10 6
529,705	Stk.	June 26	3½	Do. 3½ p.c. Deb.	£2—83	..	4 4 10
55,940	10	Feb. 26	7/14,0	North Middlesex 7 p.c.	14—15	..	5 2 8
300 000	Stk.	May 14	8	Oriental, Ltd.	117—122	..	6 11 2
60,000	5	Mar. 26	10	Ottoman, Ltd.	7½—7¾	..	6 9 0
60,000	50	Feb. 26	13	Portsea, Island B	128—131	..	4 19 3
100,000	50	,,	12	Do. C	118—121	..	4 19 2
249,980	5	April 29	8	Primitiva Ord.	5¼—6	..	6 13 4
499,960	5	June 26	5	,, 5 p.c. Pref.	4¾—5	..	5 0 0
521,600	100	June 2	4	,, 4 p.c. Deb.	91—93	..	4 6 0
346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85—87	..	4 12 0
150,000	10	May 14	6	San Paulo — 6 p.c. Pref.	10½—11	..	5 9 1
125,000	50	July 1	5	San Paulo — 5 p.c. Deb.	47—49	..	5 2 0
135,000	Stk.	Mar. 12	10	Sheffield A	223—224	..	4 9 3
209,984	,,	,,	10	Do. B	222—224	..	4 9 3
523,500	,,	,,	10	Do. C	220—222	..	4 10 1
90,000	10	May 28	9	South African	10½—11½	..	7 16 6
6,429,895	Stk.	Feb. 12	5/9/4	South Met., 4 p.c. Ord.	111—113	..	4 16 8
1,895,445	,,	July 10	3	Do. 3 p.c. Deb.	72½—74½	..	4 0 6
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157—159	..	5 6 11
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114—116	..	5 3 5
60,000	,,	,,	5	Do. 5 p.c. Pref.	110—112	..	4 9 3
137,058	,,	June 26	5	Do. 5 p.c. Deb. Stk.	116—118	..	4 4 9
629,740	Stk.	May 14	5	Southampton Ord.	99—102	..	4 18 0
120,000	Stk.	Feb. 12	7½†	Tottenham District — A 5 p.c.	135—138	..	5 8 8
742,275	,,	,,	6†	Tottenham District — B 3½ p.c.	115—117	..	5 2 7
181,255	,,	June 26	4	Tottenham District — 4 p.c. Deb.	87—89	..	4 9 11
182,380	10	Dec. 30	5	Tuscan, Ltd.	5—6	..	8 6 8
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93—95	..	5 5 3
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½—109½	..	4 11 4
				Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8½	Wandsworth A 5 p.c.	151—156	..	5 7 4
255,696	,,	,,	6½	,, B 3½ p.c.	129—134	..	5 2 7
108,075	,,	,,	5/17/8	,, C 3½ p.c.	110—115	..	5 2 0
352,000	,,	,,	6½	Wimbledon 5 p.c.	117—122	..	5 0 5
98,000	,,	,,	6½	Epsom 5 p.c.	121—126	..	5 5 2
88,416	,,	June 26	3	3 p.c. Deb. Stk.	66—69	..	4 6 11

Prices marked * are "Ex Div." † Next Dividend will be at this rate.

Stafford Gas and Electricity Committee.—A discussion in the Stafford Town Council arose out of the minutes of the Gas and Electricity Committee, on a recommendation by the Estates Committee that a gas-main be laid in a new road, and, in consideration of the Gas Committee being relieved from the capital expenditure, that a reduction be made from the usual charge for street lighting. Alderman Westhead (the Chairman of the Gas Committee) assured the members that the question of the public lighting of the road was considered from the view-point of the ratepayers as a whole; no undue preference having been accorded to either gas or electricity. Mr. Read, however, said the electricity question would never be on a satisfactory basis until the department had been separated from the Gas-Works.

Mr. Archibald C. Shelton, of Nottingham, has been appointed gas show-room superintendent at Burton-upon-Trent.

Mr. J. E. Butler, who has for many years been associated with the Long Eaton Gas Company, has been appointed Outside Manager to the Rugby Gas Company.

The Directors of the Monte Video Gas Company, Limited, have declared an interim dividend, payable on Dec. 1, of 6s. per share (less income-tax), for the half year ended June 30 last.

The title of Lights of London has been given to a Company just registered, to carry on the business of incandescent light manufacturers. The capital is £1600 in £1 shares; and the Company's address is No. 200, Streatham High Road, S.W.

While suffering greatly in health, Joseph Battye, of Littlehampton, committed suicide by inhaling gas. He was found lying dead in the scullery of his house, with a gas-ring, the tap of which was turned on, across his chest. An overcoat completely covered his face and the gas ring.

At no time within living memory, and probably never before that, has there been such a thirst for geographical knowledge as exists at this moment; and therefore general use will be found for a European War Map which is being distributed by Messrs. Fletcher, Russell, and Co., Limited, of Warrington.

Tenders for the purchase of £10,000 of "D" stock (5 per cent. maximum dividend) of the Croydon Gas Company, which were invited in the "JOURNAL" for the 27th ult., have been opened, and amounted to £27,720—ranging from £100 to £110 per cent. The average price obtained for the stock was £102 2s. per cent.

The London and North-Western Railway Company have compiled a list giving particulars as to sites and premises situated near to, or adjoining, their system, suitable for factories, foundries, &c., with or without siding connections. Among the information given is the cost of gas, water, and electricity, and the amount of the local rates—important points for consideration in the choice of a factory site.

An interesting lecture on "Coal Gas" was given recently at the Ramsbottom Technical School by Mr. F. Barrett, the Manager of the Ramsbottom Gas Company. The Chairman (Mr. Holden) pointed out to the audience that the changes and improvements which had taken place in the last few decades were positively amazing. The lecturer dealt with his subject from the historical point of view; and a number of lantern-slides were thrown upon a screen.

A lecture on "Water Heating by Gas" was delivered recently by Mr. Fred Dye (of Messrs. John Wright and Co.), at Leek, before a gathering of builders, plumbers, gas-fitters, property owners, and members and officials of the Urban District Council. Mr. W. A. Furmston (the Chairman of the Lighting Committee) introduced the lecturer, whose subsequent discourse was closely followed by his audience. In proposing a vote of thanks to Mr. Dye, the hope was expressed by Mr. Carding that builders and others would see their way to adopt gas-heated boilers in houses and other places.

Liquid and Solid Fuels Company, Limited, has been registered with a capital of £15,000, in £1 shares, to work certain patents and inventions, and to erect plants and retorts for the carbonization of coal. The first Directors are Messrs. A. M'D. Duckham, K. M. Chance, and A. Duckham; and the offices are at Palace Chambers, Westminster.

Messrs. Samuel Cutler and Sons, Limited, forward what they term a new illustrated catalogue describing some recent coal and coke handling plants. The book, however, is in reality so far from what one usually understands by the word "catalogue," that we should rather prefer to call it a valuable addition to the literature of the important subject with which it deals. Particularly does this remark apply to the account of the very large installation at the South Gas-Works of the Amsterdam Municipality. The plants for mechanical transport described and illustrated include examples from works of different sizes, so that it is not only to the engineers of large works that the contents of the book appeal. The photographs are beautifully reproduced, and the same may be said of the plans.

From the Publicity Department of the Richmond Gas Stove and Meter Company, Limited, we have received their new season's "Period" brochure. We remember the two previous lists illustrating these high-grade gas-fires; and while these were of a very high order, the present list is a supreme example of the printer's art, and deserving of considerable praise. The cloth gilt lettered case of art shade harmonizes completely with the artistically decorated cover. Inside are shown distinctly all the details of what is recognized to be a very excellent range of gas-fires designed to suit the various styles of furnishing. The "Jacobean" and "Ionic" are two of the new gas-fires added to this list. It is a mark of the progress which distinguishes all Richmond's productions, and should serve a very useful purpose in show-rooms.

Under the heading of "Active Service," the "Co-Partners' Magazine" of the Gas Light and Coke Company for the current month gives the following particulars of the Company's system of prompt delivery of small stove accessories: "Deliveries are made by means of a carrier tricycle. [An illustration of one is given.] On his return to the office, the assistant-fitter accounts for all goods delivered and returned. Only articles for hired stoves, &c., which can be fitted without the use of tools, are dealt with in this way, as a general rule. The number of deliveries made per van per day amount to between thirty and forty. The Company now have ten of these carriers at work—a spare machine being kept in case of breakdowns. Each tricycle has a short advertisement painted on the front of the box; and the cyclist is provided with a neat uniform."

APPLICATIONS FOR LETTERS PATENT.

APPLICATION FOR RESTORATION OF LAPSED PATENT.

FUEL LIMITED have made application for the restoration of the patent granted to R. S. RICHARDS and R. W. PRINGLE for "Improvements in apparatus for the distillation of coal and the recovery of the products," No. 15,643, dated July 5, 1909.

21,517.—GLOVER, S., and WEST, J., "Gas-producers." Oct. 26.
21,525.—HALL, E. L., "Purification of gases." Oct. 26.
21,626.—M'LACHLAN, R. W., "Gas-governors." Oct. 28.
21,706.—STEVENSON, J., and WILLIAMS, O. R, "Lamp suspending and lowering device." Oct. 29.
21,757.—ELY, B., and ROLLASON, A, "Treatment of waste liquors." Oct. 30.
21,777.—BURDICK, C. L., "Recording consumption of gas and its value." Oct. 30.
21,778.—IRVING, J. S., "Flexible joints for pipes." Oct. 30.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c, Vacant.

ENGINEER AND MANAGER. Weymouth Consumers' Gas Company. Applications by Nov. 28.
ASSISTANT DISTRIBUTION SUPERINTENDENT. Burnley Gas Department. Applications by Nov. 23.
JUNIOR ASSISTANT (TEMPORARY). East Hull Gas Company. Applications by Nov. 19.
DRAUGHTSMAN. C. & W. Walker, Limited, Donnington.
CHEMIST. No. 5954.
SHOW-ROOM ASSISTANT. Barnet Gas and Water Company.

Pupil Required. No. 5948.

Appointment Wanted.

SECRETARY AND ACCOUNTANT, &c. No. 5941.

Benzol Rectifying. No. 5953.

Gas-Works Wanted.

Particulars to "PRINCIPAL," Scripps's Advertising Offices, 13, South Molton Street, W.

Meeting.

ORIENTAL GAS COMPANY. Finsbury House, E.C., Nov. 25. Twelve o'clock.

Sales of Stocks and Shares.

ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY. London Mart. Nov. 17.
LEA BRIDGE GAS COMPANY. London Mart. Dec. 1.
SOUTHEND WATER COMPANY. London Mart. Dec. 1.
UXBRIDGE GAS COMPANY. London Mart. Nov. 17.

TENDERS FOR

Coke.

SUTTON-IN-ASHFIELD URBAN DISTRICT COUNCIL. Tenders by Nov. 17.

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E. Y. WOOD,
Secretary.
Nov. 5, 1914.

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